REPORT

OF THE

FOURTH INTERNATIONAL

OPHTHALMOLOGICAL CONGRESS.

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ERRATA IN DR. DUDGEON'S PAPER.

Page 51, line 12 from bottom, *after* "facts" *insert* full stop.
,, 53, ,, 18 from top, *for* "perceived" *read* "focussed."
,, 53, ,, 20 ,, ,, *for* "pupil" *read* "perfect."
,, 53, ,, 23 ,, ,, *for* "prominently" *read* "permanently."
,, 53, ,, 25 ,, ,, *for* "proportions" *read* "perfection."
,, 53, ,, 5 and 6 from bottom, *for* "disturb the proportions" *read* "destroy the perfection."
,, 54, ,, 3 from top, *for* "puckering" *read* "flickering."
,, 54, ,, 2 from bottom, *after* "organ" *insert* "and."
,, 55, ,, 21 from top, *after* "motor" *insert* "innervation."
,, 55, ,, 27 ,, ,, *for* "Czermack" *read* "Czermak."
,, 55, ,, 31 ,, ,, *for* "larger" *read* "large."
,, 55, ,, 33 ,, ,, *for* "measurement" *read* "measurements."
,, 56, ,, 19 ,, ,, *for* "movement" *read* "movements."

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FOURTH INTERNATIONAL

OPHTHALMIC CONGRESS

HELD IN LONDON,

August 1*st*, 2*nd*, *and* 3*rd*, 1872.

RULES.

I. The object of the International Periodic Congress of Ophthalmology is to promote Ophthalmological Science, and to serve as a centre to those who cultivate it. It will entertain no discussion foreign to this object.

II. The number of members is unlimited.

III. Every member must either be a Doctor of Medicine, or of Surgery, or of Science, or possess some other equivalent degree, or be distinguished for his scientific knowledge.

IV. Candidates for admission into the Society shall be admitted on presentation of their diploma or of their scientific titles, unless ten members demand a ballot.

V. The Sessions of the Society shall take place every fourth year, and shall be limited to ten days.

VI. Each Session shall be held in a different town.

VII. Before the close of each Session the Society shall fix the place for the next meeting and shall nominate a provisional committee at this place which shall be invested with absolute power for the direction and arrangement of all necessary business. This power will expire on the opening of the following Session.

VIII. The Bureau shall be composed of a President, two Vice-Presidents, of a Secretary-Treasurer, who shall fill at the same time the office of Archivist, and of an Assistant-Secretary, who shall aid the latter in his work and take his place when he may happen to be absent. Of the members of the Bureau the Secretary at least ought to live in the town selected for the meeting of the Society.

IX. The President shall direct the debates and maintain order at the meetings. With the assistance of the other members of the Bureau he shall regulate the hours of meeting, determine the order of the day, and call for the papers. The minutes of the meeting shall be signed by the President and Secretary alone.

X. The Secretary shall enter the minutes and the correspondence, shall read them, distribute the cards, and receive the subscription, which is fixed provisionally at ten francs per Session.

XI. The Society gives no diplomas. Before the opening of each Session a card available for admission to all the meetings and signed by the President and Secretary shall be given to each member on payment of his subscription, and upon signature of his name on the register of those attending the meeting.

XII. The Society shall form no collections nor library, all objects presented to the Society by its members shall be returned to them at the end of the Session. The memoirs and observations intended to be inserted into the Comptes Rendus of the Society are excepted, these are to be deposited in the Archives with the minutes of the meetings, the decisions of the Society, and the correspondence.

XIII. The Archives and the funds of the Society shall be entrusted to the Secretary, who at the close of each Session shall transmit them to the Secretary of the next Session.

XIV. A printed copy of the minutes and the other publications of the Society shall be sent to each member.

XV. The decisions of the Society shall be taken by show of hands, unless the ballot be demanded by ten members.

XVI. Decisions regularly taken during any Session are obligatory for all the members of the Society, whether present at or absent from the deliberation.

XVII. The business of each Session shall be carried on in the following order : —

1. The reading by the Secretary of the minutes of the preceding Session.
2. Presentation of Papers offered.
3. Reading of Correspondence.
4. Reading of the Reports presented to the Society, and Nomination of Commissions.
5. Verbal Communications.
6. Reading of Papers.
7. Determination of the order of the day for the next meeting, several copies of this order of the day shall be put up in the place of meeting by the Bureau.

XVIII. No Paper may last longer than a quarter of an hour, and only five minutes is allowed to each speaker, except in particular cases, where the meeting thinks proper to accord longer time.

XIX. The Society shall decide in each case whether the communication shall be printed in the Comptes Rendus as a whole or in the form of abstract.

LIST OF MEMBERS.

Those marked with an * attended the Meetings held in London, August, 1872.

AMERICA.

*Agnew (C. R.), New York.
*Desjardins (E.), Canada.
*Dyer (E.), Philadelphia.
*Green (J.), Massachusetts.
*Hayl (A. G.), Philadelphia.
Hays, Philadelphia.
*Hazen (E. H.), Iowa.
Holcomb, New York.
Homberger, New York.
*Jeffries (B. J.), Boston.
Knapp, New York.
Little, Philadelphia.
Malo (F.), New Grenada.
Mott (Valentin), New York.
*Norris (W. F.), Philadelphia.
*Noyes (H. D.), New York.
Pancoast, sen., Philadelphia.
Rodenstein, New York.
*Roosa (D. B. St. John), New York.
Seely, New York.
Stephenson, New York.
Williams (E.), Cincinnati.
*Williams (H. W.), Boston.

AUSTRALIA.

*Gosse (C.), Adelaide.

AUSTRIA.

Arlt, Vienna.
Becker (Otto), Freidelberg.
*Brettauer, Trieste.
Gulz, Vienna.
Hasner von Artha, Prague.
Jaeger (Ed.), Vienna.
Kanka, Presburg.
Meyer (Ignaz), Vienna.
Pilz (J.), Prague.
Stellwag von Carion, Vienna.
Schuleck, Pesth.
Vladesco, Bucharest.

BELGIUM.

Binard, Mons.
Borlée, Liége.
Bosteels, Anvers.
*Bribosia, Namur.
*Coppez, Brussels.
Crocq, Brussels.
Dastot, Mons.
Decaisne, Brussels.
Deroubaix, Brussels.
*Duwez, Brussels.
Feigneaux (A.), Brussels.
Gouzée, Anvers.
Gustin, St. Nicolas.
Hairion, Louvain.
Libbrecht, Ghent.
Merchie, Brussels.
*Moureau (A.), Anvers.
*Noël (Léon), Louvain.
Stiévenart, jun., Mons.
Thiry, Brussels.
Vallez, Brussels.

Van Biervliet, Bruges.
Vleminckx (J. F.), Brussels.
Warlomont (E.), Brussels.

BRAZIL.

*Barbosa.
Bustamento.
Fonseca (A.), Pernambuco.
Fragoso, Rio de Janeiro.
Gouvêa, Rio de Janeiro.
Lobo, Gama.
Pires, Rio de Janeiro.

DENMARK.

Buntzen, Copenhagen.
*Hansen, Copenhagen.
Holmer, Copenhagen.
Jacobson, Copenhagen.
Nue, Nordingborg.
Pingues, Copenhagen.
Solfverberg, Copenhagen.
Studsgaard, Copenhagen.
Toft, Copenhagen.

EGYPT.

Abbatte, Alexandria.
Agelvie, Cairo.
Mohamed-Ali-Bey, Cairo.

FRANCE.

Ancelon, Nancy.
Ancona (J.), Paris.
Blanc, Marseilles.
Boissonneau, Paris.
Bouisson, Montpellier.
Borel, Rouen.
Bossu (A.), Paris.
Caudmont, Paris.
Compérat, Sens.
Contrelet, Paris.
Coursserant, Paris.
Delacroix, Rheims.
Delavallade, Aubusson.
Demarquay, Paris.
Duchenne de Boulogne, Paris.
Fano, Paris.
Gagnon, Clermont-Ferrand.
Gaillard, Poitiers.
*Galezowski, Paris.
Giraldès, Paris.
Giraud-Teulon, Paris.
Guerin (J.), Paris.
Guillon, Paris.
Herschel, Paris.
*Hyett (N. N.), Paris.
Jaumes, Montpellier.
*Javal, Paris.
Labrouche, Bordeaux.
Lafforre (De), Paris.
Laurent, Angers.
Lejeune, Paris.
Martin, Marseilles.
Martinache, Paris.
Mathieu Miling, Paris.
Métaxas, Marseilles.
*Meyer (Ed.), Paris.
Milon, Paris.
Morpain, Paris.
Nachet, Paris.
Paris (Amédée), Angoulême.
Parmentier, Paris.
Pasquier, Paris.
Picard (A.), Paris.
Raymond, Paris.
Rivaud-Landrau, Lyons.
Rouault, Couesquelin.
Schuster, Paris.
Sichel (A.), Paris.
Sous, Bordeaux.
Saint-Vel, Paris.
Testelin, Lille.
Wecker, Paris.
Wertheimber, Paris.

GERMANY.

Alefeld, Wiesbaden.
Bartmer, Hanover.
Berlin, Stuttgard.
Bruns, Tubingen.
Classen, Rostock.
Clemens, Frankenhausen.
Coccius, Leipzig.
Cohn, Breslau.
De Welz, Wurzburg.
Durr, Hanover.
Eichenbrodt, Darmstadt.
*Esberg, Hanover.
Esmarck, Kiel.
Evers, Berlin.
Förster, Breslau
Funck, Frankfort-on-the-Maine.
Geissler, Meerane.
Gerald, Berlin.
Gieseler, Bremerlohe.
Gutbrod, Stuttgard.
Haase, Bonn.
*Hanel (G.), Dresden.
Helmholtz, Berlin.
Hering, Leipzig.
Hess, Mayence.
Hochberger, Greiz.
*Hoffmann (H. von), Wiesbaden.
Höring, Louisbourg.
Just (O.), Zittau.
Klaunig, Leipzig.
Klotz, Zwickau.
Knowe, Hamburg.
Krause, Gottingen.
Krause, Hamburg.
Küchler, Darmstadt.
Langenbeck (M.), Hanover.
Laqueur, Strasburg.
Lehman, Kiel.
Mooren, Dusseldorf.
Müller, Hanover.
Nagel, Tubingen.
Nussbaum, Munich.
Pagenstecher (A.), Wiesbaden.
*Pagenstecher (H.), Wiesbaden.
Passavent, Frankfort-on-the-Maine.
Prael, jun., Brunswick.
Prael, sen., Brunswick.
Ritter, Kiel.
Rothmund, Munich.
Saemisch, Bonn.
Schiff, Frankfort.
Schmitz, Cologne.
*Schroeders (von), Leipzig.
Schward, Nieubourg.
Schweigger, Berlin.
Spiess, Frankfort.
Sprengler, Augsburg.
Steffan, Frankfort.
Stromeyer (L.), Hanover.
Stromeyer (E.), Hanover.
Sturm. Boestritz.
Uhde, Brunswick.
Ulrich, Salzderfurth.
Unger, Dresden.
Voelkers, Kiel.
Vogelsang, Hanover.
Warnatz, Dresden.
Weber, Darmstadt.
Winter, Leipzig.
Zander, Chemnitz.
Zehender, Rostock.

GREAT BRITAIN.

*Andrew (E.), Shrewsbury.
*Bader (C.), London.
*Black (T.), Edinburgh.
*Bowman (W.), London.
Brown, Glasgow.
*Buller (F.), London.
*Carter (R. B.), London.
*Cooper (W. White), London.
*Couper (John), London.

*Cowell (George), London.
*Critchett (George), London.
*Critchett (George Anderson), London.
*Davidson (A. D.), London.
*Dudgeon (R. E.), London.
*Durren, London.
*Fitzgerald (C. E.), Dublin.
*Frank, London.
*Gillott (E. D.), Sheffield.
*Haden (H. W.), London.
*Hancock (H.), London.
*Hardy (H. N.), London.
*Hogg, (Jabez), London.
*Holthouse (C.), London.
*Hulke (J. W.), London.
*Hutchinson (J.), London.
*Jackson (J. H.), London.
*Jones (H. M.), Cork.
*Koppen, London.
*Lawson (G.), London.
*Liebreich (R.), London.
*Little (D.), Manchester.
MacGavin, Edinburgh.
MacGavin, London.
*Nieden, London.
*O'Leary (P.), Cork.
*Power (H.), London.
*Reed (T.), Glasgow.
*Robertson (D. A.), Edinburgh.
*Rogers (G. H.), London.
*Samelson (A.), Manchester.
*Streatfeild (J. F.), London.
*Tay (Waren), London.
*Taylor, (R.), London.
*Teale (T. Pridgin), Leeds.
*Walker (Alfred), London.
*Walker (James), Leeds.
*Walker (T. S.), Liverpool.
*Wall (Thomas), Cork.
*Watson (W. S.), London.
*Wells (J. Soelberg), London.
*Wilson (A.), Dublin.
*Wilson (Henry), Dublin.
*Windsor (Thomas), Manchester.
*Wolfe (J. R.), Glasgow.
*Workman (C. J.), Devon.

GREECE.

Anagnostakis, Athens.
Röser, Athens.

HOLLAND.

Baart de la Faille, Leeuwarden.
Baudin, Japon.
Blom Coster, La Haye.
Broecke (Van den), Middelburg.
Broers, Utrecht.
Burg (Van Den), Batavia.
Dissel (Van), Lochem.
*Dönders, Utrecht.
Dommelen (Van), La Haye.
Dyck (Van), Dreumel.
Doyer, Leyden.
Eichstorff, Brielle.
Eichstorff, Smyrna.
Eichstorff, Zuylen.
Fles, Utrecht.
*Gori, Amsterdam.
Gunning, Amsterdam.
Haan (Vroesom de), Veenhuizen.
Haffmans, Roermond.
Hamer, Utrecht.
Haas (de), Rotterdam.
Haerten, Utrecht.
Hartevelt, Rotterdam.
Hattem (Van), Batavia.
Hissinck-Janssen, Groningen.
Hoeven (Van der), Rotterdam.
Hofman, Veenhuizen.
Hoogenstraeten, Batavia.
Imans, Utrecht.
Klep, Oosterhout.
Koster, Utrecht.
Krieger, Leyden.

Krol, Utrecht.
Kroon, Zutphen.
Lindeboom, Zwolle.
Lissa (Van), Middelburg.
Lulofs, Hardinxfeld.
MacGillavry, Java.
Maes, Amsterdam.
Moll, La Haye.
Onnen, Batavia.
Oudenhoff, Utrecht.
Reeken (Von), Monnikendam.
Reysen (Van), Haarlem.
Sasche, Nieuwe Diep.
Salomons, Veenhuizen.
Scharff, Oostzaan.
Schrant, Leyden.
Schoenmaker, Borne.
Schubaert, Utrecht.
Snellen, Utrecht.
Stark, Rhenen.
Suick, Utrecht.
Sweens, s'Hertogenbosch.
Themmen, Deventer.
Tilanus, Amsterdam.
Vos, Breukelen.
Wessem, (Van), Amsterdam.
Wicheren (Van), Utrecht.
Willemier (Quarin), Utrecht.

ITALY.

Arcoleo, Palermo.
Borelli (J. B.), Turin.
Calderini, Turin.
Grosetti, Brescia.
Magni (F.), Bologna.
*Mannhardt, Florence.
Olivieri, Naples.
Perillo, Luce.
Pertile, Padua.
Ponti Floriano, Parma.
*Quaglino, Milan.
Reymond, Turin.
Secondi, Gênes.
Sperino (C.), Turin.

MEXICO.

Iglesias, Mexico.

PORTUGAL.

Loureiro, Lisbon.
Marques, Lisbon.
Sa Mendes, Lisbon.

RUSSIA AND POLAND.

Berthenson, St. Petersburg.
*Blessig, St. Petersburg.
Bohdanowski, Moscow.
Braun, Moscow.
Claus, Ural (Poland).
Dombrowski (B.), Ural.
Flowitz, St. Petersburg.
Froebelius, St. Petersburg.
Hartman, St. Petersburg.
*Hirschman, Karkow.
Huebbenett (De), Kiew.
Hynsag, St. Petersburg.
Iwanoff, St. Petersburg.
Junge, St. Petersburg.
Kabath (De), St. Petersburg.
Kischineff, St. Petersburg.
Klien, Moscow.
Kronewitch, Poland.
Leich, St. Petersburg.
Lotin, St. Petersburg.
Matuschenkow, Moscow.
Pfoehl, St. Petersburg.
Seydewitz (Baron von).
Tamanscheff, St. Petersburg.
Waldauer, Riga.
Wernicky, Poland.
Wilkousky, St. Petersburg.
Woinow, Russia.
Zagiell, Prince Ignace, Poland.

SPAIN.

Calvo y Martin, Madrid.
*Carreras, Barcelona.
*Cervera, Madrid.
*Chiralt (Vicente), Seville.
*Delgado Jugo, Madrid.
Montaut, Madrid.
Pédraglia, Madrid.

SWEDEN AND NORWAY.

Asplund, Gothenburg.
Bjorken, Upsal.
Boeck, Christiana.
Edholm, Helsingfors.
Estlander, Helsingfors.
Faye, Christiana.
Heiberg, Christiana.
Keyser, Christiana.
Lundberg, Stockholm.
Miloch, Helsingfors.
Rossander, Stockholm.
Thilesen, Christiana.
Tornblow, Stockholm.

SWITZERLAND.

Baenziger, St. Gall.
Dor, Berne.
Dufour, Lausanne.
Horner, Zurich.
Moricand, Geneva.
Schiess, Basle.

TURKEY.

Agelastos, Constantinople.
Huebsch (De), Constantinople.
Sarandi, Constantinople.

REPORT OF THE PROCEEDINGS

OF THE

FOURTH OPHTHALMOLOGICAL CONGRESS.

The Fourth Anniversary of the Ophthalmological Congress was held in London during the first three days of the month of August, 1872.

By the kindness of the Council of the College of Physicians the Library of the College was placed at the disposal of the Congress, and all the meetings were held there.

The following gentlemen entered their names or presented their cards as attending the meetings:—

Dr. C. R. Agnew	19, East Thirty-Ninth Street, New York, U.S.A.
Dr. Edwyn Andrew	Shrewsbury.
Dr. Carreras y Arago	Barcelona.
C. Bader	10, Finsbury Circus.
Jas. Bankart	Exeter.
Dr. Barbosa	55, Oxford Terrace, Hyde Park.
T. Black	2, George Square, Edinburgh.
Dr. Blessig	St. Petersburg.
William Bowman	5, Clifford Street, Bond Street.
Dr. Brettauer	Trieste, Austria.
Dr. Bribosia	Namur.
Dr. F. Buller	49, Norfolk Square, W.
Robert Brudenell Carter	69, Wimpole Street.
Dr. Cervera	66, Tacometrezo, Madrid.
Dr. Vicente Chirálт	13d, Remondo, Seville, Spain.
W. White Cooper	19, Berkeley Square.
Dr. Coppez	Brussels.
John Couper	80, Grosvenor Street.
George Cowell	65, Belgrave Road.

George Critchett	21, Harley Street.
George Anderson Critchett	21, Harley Street.
Dr. A. D. Davidson	22, Westmoreland Place, Westbourne Grove.
Dr. Delgado Jugo	65, Atocha, Madrid.
Dr. E. Desjardins	Montreal, Canada.
Professor Donders	Utrecht, Holland.
Dr. D. Doyer	Leyden, Holland.
Dr. Dudgeon	53, Montagu Square, W.
Dr. Durren	68, Torrington Square.
Dr. Duwez	Brussels.
Dr. E. Dyer	1429, Walnut Street, Philadelphia.
Dr. Esberg	Hanover.
Dr. Ewers	Berlin.
Dr. Fitzgerald	11, Upper Pembroke Street, Dublin.
Dr. Frank	44, Rutland Gate.
Dr. Galezowski	29, Boulevard Haussmann, à Paris.
Edward D. L. Gillott	Sheffield.
Dr. Gori	Amsterdam.
Dr. Charles Gosse	Adelaide, S. Australia.
Dr. John Green	1613, Washington Avenue, St. Louis, Mass., U.S.A.
L. Gulstad	Odense, Denmark.
Dr. Haden	66, Harley Street.
Dr. G. Hänel	9, Königstrasse, Dresden.
Dr. Edmund Hansen	Copenhagen, Denmark.
H. Nelson Hardy	21, Fitzroy Square.
Dr. Albert G. Hayl	Philadelphia, U.S.A.
Prof. E. H. Hazen	Davenport, Iowa.
Dr. Wilh. Hess	Mainz, Germany.
Dr. Hirschmann	Charkow, Russia.
Dr. H. von Hoffmann	Wiesbaden, Germany.
Jabez Hogg	1, Bedford Square, London.
Carsten Holthouse	3, George Street, Hanover Square.
J. W. Hulke	10, Old Burlington Street.
Jonathan Hutchinson	4, Finsbury Circus.
N. N. Hyett	Paris.
J. Hughlings Jackson	3, Manchester Square.
Dr. Javal	Paris.
Dr. B. Joy Jeffries	15, Chestnut Street, Boston, U.S.A.
Dr. H. Macnaughten Jones	4, Camden Place, Cork.
Dr. Koppen	68, Torrington Square.
George Lawson	12, Harley Street.
Richard Liebreich	16, Albemarle Street.
Dr. Little	St. John Street, Manchester.
Dr. Gama Lobo	Brazil.
Dr. Mannhardt	Florence, Italy.
Frederick Mason	Belmont, Bath.
Edward Meyer	Paris, 17, Boulevard Madeleine.
Dr. Alph. Moureau	Rue des Tanneurs, Anvers, Belgium.

Dr. Nieden	German Hospital, Dalston.
Dr. Léon Noël	Louvain, Belgium.
Wm. F. Norris	1534, Locust Street, Philadelphia.
Dr. Henry D. Noyes	New York.
Professor Purcell O'Leary	Queen's College, Cork, Ireland.
Dr. Osio	Barcelona.
Dr. Hermann Pagenstecher	Wiesbaden.
Henry Power	37A, Great Cumberland Place, Hyde Park, W.
Dr. Antonio Quaglino	Milan.
Thomas Reed	9, Elmbank Street, Glasgow.
Dr. Charles E. Rider	Rochester, New York, U.S.A.
Dr. D. Argyll Robertson	40, Queen Street, Edinburgh.
G. H. Rogers	14, Old Burlington Street, W., London.
Dr. D. B. St. John Roosa	20, East Thirtieth Street, New York.
Dr. A. Samelson	15, St. John Street, Manchester.
Dr. Secondi	Genoa.
Dr. Schmidt	
Dr. von Schroeders	Augenheilanstalt, Leipzig.
The Baron von Seydewitz, M.D.	4, Coleherne Road, W. Brompton, S.W.
Dr. Alexander Spiess	Frankfort-on-the-Main, Germany.
J. F. Streatfeild	15, Upper Brook Street, London.
Dr. Szozygielski	
Waren Tay	10, Finsbury Pavement.
R. Taylor	7, Lower Seymour Street.
T. Pridgin Teale	38, Cookridge Street, Leeds.
Wm. Thomson	1607, Locust Street, Philadelphia.
J. F. Vleminckx	Brussels.
Dr. Vogelsang	Hanover, Germany.
Alfred Walker	Royal London Ophthalmic Hospital.
James Walker	22, Park Square, Leeds.
T. Shadford Walker	82, Rodney Street, Liverpool.
Dr. Wall	41, South Mall, Cork.
Dr. Warlomont	Brussels.
W. Spencer Watson	7, Henrietta Street, Cavendish Square, London.
Adolf Weber	Darmstadt, Germany.
Dr. de Wecker	7, Avenue d'Antin, Paris.
Soelberg Wells	Savile Row, London.
Dr. H. W. Williams	Boston, U.S.A.
A. Wilson	29, Baggot Street, Dublin.
Professor Henry Wilson	Dublin.
Thomas Windsor	44, Ardwick Green, Manchester.
Dr. Woinow	Moscow, Russia.
Dr. J. R. Wolfe	18, Brandon Place, Glasgow.
Dr. Workman	Teignmouth, Devon.
Dr. Zehender	Rostock, Mecklenburg.

The first meeting took place at 10 A.M. on the 1st August, when Mr. Critchett, being called unanimously to the Chair, made the following address to the Members, which has been translated from the French in which it was delivered:—

GENTLEMEN,—At the meeting of the Ophthalmic Congress at Heidelberg about this time last year, where I was almost the sole representative of England, the question of the next meeting of the International Congress was discussed, and difficulties having arisen in selecting a Continental capital in consequence of the recent war, I ventured in the name of my colleagues and in my own to propose that the next meeting of the International Ophthalmic Congress should be held in London. That proposition on my part was received by a crowded assembly of oculists with great enthusiasm. On my return to England I called a meeting of my colleagues, who warmly co-operated with me in organizing such measures as might insure a successful result. A working committee chosen from our various ophthalmic institutions was formed. Mr. Soelberg Wells undertook the responsible duties of secretary, and such steps were taken as have been found most conducive to the prosperity of such meetings on the Continent. We were fortunate in securing the co-operation of the College of Physicians, who have in so generous a manner placed this noble library at our disposal. It is gratifying to me to find that the invitation to London that I ventured to give in Heidelberg has been so numerously accepted. The presence here to-day of so large an assembly of oculists from all parts of the civilized world is a source of great pleasure to myself personally and to my colleagues, and in their name and in my own I beg to offer you a hearty welcome, and I beg to assure you of our anxious desire to do everything in our power to render your visit to London instructive and amusing. Such meetings not only conduce to the advance of science by the co-operation and mutual interchange of thought, of kindred, and enlightened minds, but they tend to cement old friendships and initiate new ones, to soften down rivalries and jealousies, to elevate the tone of our profession, to bring us all more and more under one common brotherhood, actuated by a sincere desire to promote the welfare of our fellow-creatures and the cause of science. Our committee had two questions of some difficulty to decide. The first had reference to the language in which the discussions should be held, and it was finally decided that, in deference to our numerous foreign confrères, French should be

used as much as possible; the second question had reference to the date of the meeting. Although we fear that some of our most valued and distinguished colleagues and professors have been unable to be with us in consequence of the early date, yet there would have been so many serious inconveniences in fixing a later period of the year, that after much anxious consideration the committee fixed upon the present time. It only remains for me to state that at a preliminary meeting of the permanent committee it has been recommended to this meeting to elect the following gentlemen to fill the offices of President, Vice-Presidents, and Secretaries. I feel sure that I shall only be anticipating the thought and the wish of every one present when I state that Professor Donders is nominated as your President. The voice of Europe proclaims him as the recognised chief in the science of ophthalmology. His profound erudition both as a linguist and as a pioneer and original discoverer in our art peculiarly set him apart as the President of this Congress, and as the mouthpiece of this assembly I request that he will occupy the Chair.

M. Warlomont, of Brussels, has been nominated one of your Vice-Presidents.

When we recall how active a part was taken by this gentleman in the inauguration of ophthalmic congresses, how influential he has been through the agency of the journal in diffusing far and wide a knowledge of ophthalmology, and how extensively he is known by the eminent members of our profession in every part of the civilized world, it will be felt by all present that this compliment is well deserved. In selecting as our other Vice-President Mr. Williams, of Boston, we have been anxious to recognise the high scientific position of this gentleman, and also to mark our respect and esteem for our Transatlantic brethren who have come over so numerously to attend this Congress, and who are doing so much to advance the science in which we are all so deeply interested. Mr. Soelberg Wells, to whom we are so much indebted for acting as secretary to the provisional committee, and who has devoted so much time and attention to the organization of this Congress, will continue to perform the duties of Secretary, assisted by Professor Zehender, so well known for his scientific and literary labours. (Cheers.)

At the conclusion of the address the President, Vice-Presidents,

and Secretaries took their respective places, and the business of the Congress commenced.

Prof. Donders: Gentlemen, I am extremely obliged to you for the honour you have conferred upon me, and I shall certainly exert every effort to make myself worthy of your confidence. The task before me is beyond my powers, but I feel that in the very circumstance of my having been selected by you to fill this office I have the guarantee that you will be kind and indulgent to me. We are honoured by the presence of distinguished men, many of whom have come from remote regions, and who are all animated by the desire of aiding in the advance of science; and Mr. Critchett, our colleague and friend, has just welcomed us with all the cordiality for which he is so well known to the hospitable soil of England. Whilst then, gentlemen, you will on the one hand open the stores of your knowledge to your confrères, you will on the other endeavour to obtain food for your own thoughts in listening to the results of the observations of others, and having in view the common interests of humanity alone, will be as ready to give as to receive. The department of medicine you practice is acknowledged on all hands to be not so much an art as a science, and there is scarcely any other subject in which art and science are so closely united. Helmholtz has said that in our day ophthalmology occupies the same place in regard to other branches of medicine that astronomy holds to physical science. It is the model to which all must conform. Nor must we omit to offer our tribute of gratitude to the illustrious man who, in the ophthalmoscope, has supplied us with a means of investigation upon which as yet scarcely any improvement has been made, and to the immortal master whose genius has spread its light over all parts of our branch. We must not forget also that *noblesse oblige*, and that it is our duty to maintain in ophthalmology that precision which is its glory. On this, however, I will not insist, having full confidence that this Congress, in avoiding all superficial research, all vague assertions, will furnish an additional proof, were that requisite, that we are all faithful to our duty. The aim of the Congress will be attained if on parting we can cordially shake hands, and carry away with us the conviction of having contributed our quota to the progress of art and science in the interests of humanity. May our efforts be successful. As Mr. Critchett has stated, it is desirable that all discussions should be as much

as possible conducted in French. It is the language which probably divides us the least. But for the accommodation of those who desire a translation, a brief analysis in English shall be given when required. The new candidates—those who have joined us to-day for the first time—must present their cards, so that their names may be proposed as members of Congress, according to custom.

The new members put their cards of admission on the table, and their names were severally called out from the Chair.

The rule upon the election of new members says—

(Here the paragraph of the statutes referring to election, scrutiny, &c., was read.)

M. Donders: Is there any one in the assembly who wishes that there should be a scrutiny?

There being no reply,

M. Donders said: Then these gentlemen are named members of Congress. They are MM. White Cooper, Charylin, Giraud-Teulon, Cervera, who are all present. There are amongst us those to whom our sincere thanks are due for the manner in which they have acquitted themselves in the offices conferred upon them. Amongst those I must name Critchett, Bowman, and others. There are also names whose absence we can only regret. Let us now commence proceedings. I call on Mr. Joy Jeffries.

Ether in Ophthalmic Surgery.

By Joy Jeffries, M.D., *Boston, United States.*

Every week gives us some substantial proof of the fatality of chloroform in operative surgery. A certain degree of anxiety therefore must always be present in the operator's mind, from which he cannot free himself, even if an equally competent person administers the anæsthetic. If these propositions are not true, then there is no force in what I have here to say. I do not advocate the use of ether because I come from the city where its employment in surgery was discovered and promulgated, but because I believe that there are others like myself who do not desire to run the risk of killing a patient with chloroform, and who perhaps would gladly avail themselves of ether were they rendered as familiar with its administration and harmlessness as we are in America. Let me be clearly understood. I use and advocate ether because it is as effectual as chloroform, and not dangerous to life. I should not hesitate to use chloroform, though perhaps not so freely as ether, did the latter not exist.

As we have ether, I cannot feel justified in using chloroform, and never have done so. I should not unless forced to; therefore it is that I desire to induce others to familiarize themselves with the use of ether. I believe that those who now use chloroform exclusively, and who can never do it without danger to the patient, would employ ether did they understand how to do so. I would unhesitatingly say that I think this is largely the reason why ether is not made use of; and I opine there is some indefinable dread of it, caused by the fatality of chloroform, simply because ether is an anæsthetic. Now I desire to say at once that I believe it is difficult to kill any one with ether, and that death never occurs accidentally while it is being inhaled. The accumulated evidence on this point is sufficient for me at least, as the accumulated evidence of the fatality of chloroform is sufficient to deter me from ever using it unless forced by necessity. That ether is more difficult to take and to administer I recognise and appreciate as well as any one. I do not wish to be harsh with my medical brethren either at home or abroad, but I cannot but think that the disagreeable properties of ether induce some to run the risk of the use of chloroform, which may be fatal—when, who can foretell? I do not propose to enter into any discussion as to the action of ether, or the special methods of using it. I would, however, say that many of the disagreeable symptoms produced by ether—nausea, vomiting, and headache—may be avoided or mitigated by the patients taking no, or but a light, supper the evening previous to the operation, and absolutely *no food whatever* the morning of the operation, which should, if possible, be done not later than 9 or 10 A.M. Ether at the worst is but a profound intoxication, and not unlike a drunken fit. On the other hand, thousands inhale it without trouble, as proved by their anxiety to take it a second time if necessary. A towel rolled into a cone, with a napkin or sponge pushed to the top of the inside, is all we need to pour our ether on, whilst our fingers can mould it over any mouth and nose. Some years ago I often heard in Europe medical gentlemen say, "But there are so many people who cannot take ether." I have yet to see one. The truth is, I believe, that surgeons who use chloroform are afraid of ether, and do not dare to give enough of it at once in the commencement. Now, if the patient be warned that the ether will choke him, and told when this occurs to take long breaths to relieve it, and not to struggle and endeavour to push away the sponge, many will go to sleep quietly and without trouble to themselves or the surgeon. I have but one other point to speak of in reference to giving ether. When the patient, whether old or young, struggles and asks for a respite and fresh air, do not yield. Hold him down by main force if necessary, and at any rate keep the sponge tight over the mouth and nose till he finally takes long breaths, and then soon goes off into

ether sleep. Doing this prevents him remembering anything about his struggles. It is absurd to stop the ether and try to reason with adults excited by the anæsthetic, and cruel not to push on quickly with children. This may sound almost puerile to my American brethren, but my personal experience tells me that those who use chloroform have somehow a sort of dread of ether, as if it was to be suddenly fatal, and hence fail to give a patient enough to intoxicate him quickly. This arises from lack of familiarity with its use and administration.

In ophthalmic surgery there are several special reasons for the employment of ether. In the first place, death during any other surgical operation might be allowed to pass without creating undue or severe comment, but no community would overlook a death occurring from any anæsthetic during the extraction of cataract, an iridectomy, or the removal of the globe. A possible fatal result is not included in ophthalmic surgery. In my own community I should not care to have a patient die from chloroform under my hands, and be myself tried for manslaughter afterwards. The prosecuting attorney could put scores of surgeons in the witness-box, whose evidence to the jury would be unanimous that I might have employed ether, which is not fatal, and hence the responsibility of the fatality of chloroform rested entirely upon me. It would be an ugly case. Another argument for ether is that it leaves the mind of the ophthalmic surgeon entirely free from any anxiety or thought of the anæsthetic. When the operation does not require him to have an assistant, he may dispense with one to administer the ether, and give it himself, as a little care will enable him to avoid benumbing his fingers with the cold, and any bystander can hold the sponge over the patient's mouth while he sleeps. I do not mean that an assistant is not a convenience, but that with ether we may dismiss thought for the patient's pulse, &c., since blueness of the face over which we are working tells us when to take off the sponge and when to reapply it. Moreover, operations are very frequent in ophthalmic practice, and an assistant to whom we may commit the administration of chloroform is not always at hand or readily obtained, whilst the necessity for immediate operation may from various causes be very pressing. For myself, I find there are but few ophthalmic operations which I hesitate to undertake alone under ether, when compelled so to do. I do not find that medical gentlemen feel thus about chloroform. Here let me answer by *experience* the *theory* that ether will not act favourably in many ophthalmic operations, in consequence of the nausea and vomiting liable to follow its use. In the ophthalmic hospital with which I am connected, some fifty Graefe's extractions are annually done, almost always under ether, without the subsequent nausea or vomiting, provided this takes place at all, seeming

to interfere with the usual course of the recovery or the final result. Some three hundred other operations are also performed under ether. We never use chloroform. I will say nothing of the use of ether in the general hospitals of my own city, as I desire to confine my remarks to ophthalmic surgery, in which I consider ether a blessing to both surgeon and patient. Finally, I would sum up what I mean, and would observe that ether is never fatal in surgery, but that it can always be used in ophthalmic practice, as it does not interfere with the operation or its results, it allows the operator to work alone, if compelled to, and free from thought of the patient's condition. I admit that it is not so pleasant to give or take as chloroform. With those who can administer this latter without anxiety, and can rest at peace with their own conscience and the community in which they live after a fatal case under their hands, my remarks can of course have no force, and for such they are not intended.

Mr. Brudenell Carter said: I much regret, sir, the absence from among us of a gentleman who, more than any other in London, is in the habit of administering ether—Mr. Warrington Hayward, the surgical registrar and chloroformist to St. George's Hospital. He has advocated very strongly the use of ether in general surgery, but his experience is, and I must say that mine entirely coincides with it, that ether as an anæsthetic agent does not produce sufficient muscular relaxation to fulfil all the requirements of the ophthalmic operator. As we have had it administered at St. George's Hospital, we have certainly found that the recti muscles have not been rendered passive in the degree that I should desire, and, after some experience, both Mr. Hayward and myself have determined to lay it aside, and return to our old and trusted friend chloroform, of which I must say we have no fear, and which we have never had any reason to regret using. It is with great deference that I venture to question the statement of Dr. Joy Jeffries about the safety of ether, but, unless my memory plays me altogether false, there have been deaths from ether recorded in surgical history. I think that when anæsthetic agents were first introduced, and ether was the only one considered to be of any practical value, certain deaths did occur. I shall be grateful, sir, if Dr. Jeffries will come to St. George's Hospital and administer ether for us, that we may see whether our past dissatisfaction with it may be in any way due to our faults of administration.

Dr. O'Leary observed that many differences in the effect of ether, when administered as an anæsthetic, were due to diffe-

rences in the purity of the drug. He believed it to be a perfectly safe remedy, provided it be pure.

Mr. Jabez Hogg said that after much experience with various anæsthetics he preferred to operate without any. The resistance of the recti muscles was the best possible aid to extraction.

Dr. Jeffries: I would say, in answer to Mr. Carter, that the Medical Society in Boston appointed a committee some years ago to investigate all the reported cases of deaths by ether. That was done, and they could not find that any one of those reported deaths was due to the anæsthetic. When the muscles are too tense for the operation I doubt if ether enough has been given.

The next paper was—

On Incision of the Optic Nerve in Cases of Neuro-retinitis.

By L. de Wecker.

Mr. President and Gentlemen,

I beg leave to submit to you a short account of certain observations that I have lately made at my clinique, on a new treatment for neuro-retinitis. I am as yet unable to give you complete results, but simply some idea of a new operation, with the hope that, with your co-operation and further experience, it will be admitted into ordinary practice. You are aware that the investigations of Schwalbe, continued by H. Schmidt, Manz, and others, have shown that the liquid contained in the arachnoidal space can in cases of exaggeration of the intercranial pressure be forced through the optic foramen between the two coats of the optic nerve up to its insertion into the eye. Here the liquid meeting an obstacle in the sclerotic ring produces distension of the external coat on the one hand, and on the other, strangulation of the contents of the nervous sheath (fibres and vessels), which would explain the disturbance of vision, and the secondary atrophy of the nerve itself.

I shall not here enter into any discussion as to whether Schwalbe's theory is applicable in all cases, and as to whether the dropsy of the optic nerve is constant in every case of confirmed neuro-retinitis. It seems to be indisputable that in the great majority of necroscopis this distension of the external sheath near the eye has been met with, and that Schwalbe's theory affords the most satisfactory explanation of the production and symptoms of neuro-retinitis.

According to this theory, I consider that there are two indications to be fulfilled: in the first place, to give issue to the accumulation of the

cerebral liquid by making an incision into the external coat of the optic nerve; and secondly, to relieve the strangulation of the nerve by incising the sclerotic ring where it forms the junction of the sheath with the external enveloping membrane of the eye. In proceeding thus, I hoped to relieve the symptoms of compression, not only of the nerve itself, but of those of the cerebral centres—in other words, to remove the pain and inconvenience arising from the excess of intercranial pressure.

It is, I think, the first time that this operation has been attempted; but before adopting it myself I tried it on the dead body, and felt convinced that the operation might be performed on the living subject without any risk. I have performed the operation in two cases of cerebral affection (probably tumours of the cerebrum). In one of the cases, a man of forty (operated on on the right eye), neuro-retinitis was completely regressive on the right eye, and on the other regressive also. There was only a slight degree of vision, scarcely allowing of the patient to do any work, even if the weakness of the legs, with which he was at the same time affected, had permitted it.

The other patient, a woman of thirty (operated on on the left eye), was completely blind, and was at the same time the subject of paraplegia, partial paralysis of the left facial nerve, and great difficulty of moving the tongue. She also suffered a great deal from incessant headache. The neuro-retinitis was in this case evidently regressive in both eyes, and especially in the left. The operation was performed as follows :—

I made an incision between the rectus externus and the rectus inferior muscles, at a distance of one centimetre from the margin of the cornea. Then cutting the conjunctival and sub-conjunctival tissues, I penetrated between the eye and Tenon's capsule with a pair of probe-pointed scissors till I reached the optic nerve. I then introduced a spatula, and luxated the eye upwards and inwards. It is easy after the luxation of the eye to feel with the spatula the distended nerve, and to introduce the sheathed neurotome, an instrument which I got M. Mathieu to make me for the purpose.

The mechanism of this instrument is such that by slight pressure on the spring, only that part of the nerve is cut with which it is placed in contact, at a distance of one centimetre behind the eye. The operator then incises the sheath of the optic nerve and the sclerotic ring, moving and pressing the instrument from behind forwards. He then removes the instrument after having pushed the spring back, so that it cannot cut further than is desired.

The next time I perform the operation I intend introducing the finger up to the nerve for the purpose of more easily placing the instrument in proper position.

The hæmorrhage that follows is very slight, the eye is then replaced in its former position, and bandaged in the ordinary way.

Both the patients left my clinique four days after the operation. The principal points I noticed are the following :—

1. There was no pain after the operation, which was performed without the aid of anæsthetics. 2. Very great relief of the headache, especially the side operated upon. 3. In removing the bandage twenty-four hours after the operation I noticed a very slight congestion of the eye ball, the pupil deviated to the opposite side of the penetrating wound, which was probably the result of the rupture of the ciliary nerves. This deviation of the pupil disappeared in a few days. 4. The operation having been performed in complete regressive forms of *neuro-retinitis*, I did not in the least expect any amelioration of the sight; nevertheless the male patient seemed to have improved in the operated eye, for in a week he was able to perceive the light. The beneficial result in this case seems to me indisputable, and the medical men who assisted at the operation were of the same opinion, as the operation had a marked influence on the headache, and on the general state of the health. The male patient was able to stand more firmly on his legs and answer questions promptly. He seemed delighted with this operation, on account of the general relief he had experienced, although he had gained nothing so far as sight was concerned.

The result of the operation was less manifest in the female patient, who was only relieved of her headache.

The ophthalmoscope did not discover the incision, which perhaps was not made deeply enough : but there was a slight increase in the volume of the vessels, especially of the veins.

In conclusion, I beg to observe that this first attempt sufficiently proves that the operation (neurotomy) can be safely performed. With your concurrence I hope it will have good result, not only for the vision but for the cerebral affection and general health of the patient.

M. Galezowski : Gentlemen, the operation which M. Wecker proposes appears to me difficult to be applied usefully. In the first place, the operation itself is both difficult and dangerous. But a more important objection to it is that it cannot give a favourable result, even when successfully performed, since optic neuritis is generally an affection supervening in cerebral tumours, meningitis, and other serious lesions of the contents of the cranium, which, indeed, are usually fatal. We do not therefore see clearly what good result can be obtained from an operation of this kind performed in the course of a fatal disease. I do not

agree in the opinion of Schwalbe, that in all cases of optic neuritis there is dropsy of the sheath of the optic nerve. I have myself made more than fifteen autopsies of cases of optic neuritis where cerebral tumours have existed, and I have only met with serum in the optic sheath in one solitary instance, and that was in a case of cerebral meningitis. In none of these cases then would the operation have been appropriately undertaken.

M. Donders: Where do you make the incision? I should imagine it to be dangerous to divide the scleral ring. The incision into the sheath is of very great importance. As regards the theory of Schwalbe, I believe his statements to be correct.

A Member: Why do you divide the scleral ring at all?

M. Wecker: I divide the scleral ring to avoid the possible strangulation of the nerve. (M. Wecker here made some sketches on the blackboard showing the exact position of the incision he recommended.) Obviously there is some danger in dividing the scleral ring, and I regard this part of the operation as the most difficult, though it cannot be considered as the most important. I agree with M. Donders that the making of the incision where the optic nerve divides must be kept in view as the most essential point of the operation. In regard to M. Galczowski's observations, I do not for a moment suppose that this operation, like every other new method, will be adopted without much examination and circumspection, but I have not given the least encouragement for its employment in cases of cerebral tumours. I selected these cases because they were desperate and I did not anticipate any good results from the employment of other measures. I have said nothing in favour of the operation in cases of cerebral affections. I would remark in addition that the above cases include my experience alone, and that the selection of others must be left to the operators. M. Galczowski believes he has only met with one case of œdematous swelling of the sheath of the optic nerve in sixteen that he has examined, but this result is in opposition to the statements of most authors on the subject. M. Schwalbe's theory certainly admits of discussion when applied to some cases, but it offers the best explanation as yet advanced of most instances of optic neuritis.

M. Donders: Our best thanks are due to M. Wecker. (Applause.)

On Sympathetic Ophthalmia.

By Dr. Warlomont.

When we make use of the term Sympathetic Ophthalmia we now mean to indicate a disease affecting a previously healthy eye, consequent upon injury to the opposite one. Originally clearly defined by Mackenzie in the year 1843, it has since been generally known under this name, and is now recognised by a definite Symptomatology. For the great Scotch oculist Sympathetic Ophthalmia is an inflammation which, commencing in the retina, terminates by invading gradually all the internal tissues of the eye, especially the iris, the crystalline lens, and the vitreous; which develops itself in general from five to six weeks after the other eye has received an injury, and terminates in most cases in atrophy or complete amaurosis of the eye secondarily affected.

From the moment that attention was seriously called to this interesting point of ophthalmic pathology, observations were made upon large numbers of cases, and very soon the line of treatment to be adopted received careful consideration. Mackenzie already advised the eye originally affected to be opened, and either its removal, or at least the abscission of its anterior parts; a plan that was very generally recommended and adopted, especially by the English.

The enucleation of the eye first affected is then the ultima ratio of modern treatment in Sympathetic Ophthalmia, whether it be applied as a curative measure, or as affording a chance of success in a prophylactic and preventive point of view.

But what does the term Sympathetic Ophthalmia really mean? Is its signification limited to that which was given to it by Mackenzie and by nearly all authors who have written since his time? Must we confine it only to the irido-cyclitis that usually manifests itself in an eye which has become affected as a consequence of the disease of the other? I do not think so. I admit without restriction the fact, that when a wounded eye, or even a stump constituting the remains of a more or less recent lesion, is acutely sensitive, or is the seat of pain specially affecting the ciliary regions, the other eye is peculiarly liable to cyclitis or irido-cyclitis. In other cases, as in those, for example, where the sympathy expresses itself as the result of wounds or of traumatic inflammation of other regions of one eye, producing slow atrophy of the globe, the injured eye becoming progressively reduced to the smallest dimensions and enclosing a cretaceous lens which acts as a foreign body—in all such cases, whether acute pain supervenes or it remains perfectly indolent, the opposite eye is alike threatened with this and other dis-

orders, and these disorders, in opposition to the statements of authors, can affect all other parts as well as the ciliary or uveal region.

I think therefore that the denomination Sympathetic Ophthalmia must be replaced by the words cyclitis, irido-cyclitis, irido-choroiditis, retinitis, keratitis, conjunctivitis, &c., from sympathy, which will enable us to render clear and to localize usefully the phenomena presented by the affections in question.

Nor do I stand alone in this opinion; at the last Congress at Heidelberg, M. Cohn, of Breslau, cited two facts from which it appears that sympathetic phenomena may manifest themselves in the absence of all alterations of the ciliary body or of the iris, and he added that he did not know any analogous fact in the whole literature of the diseases of the eye. In both cases the enucleation of the wounded eye, in spite of the absence of iritis or of irido-cyclitis, was followed almost immediately by the return to its normal state of the previously much affected region of the opposite eye.

The following is another observation bearing upon the same point, which is not without interest:—

Case I. Désirée Bosse, æt. twenty-five, of lymphatico-sanguine temperament, was born of healthy parents, and has always enjoyed excellent health. At the age of eight years she received on the right eye a blow from the horn of a cow, which confined her to her bed for three weeks from the general shock, as well as from the pain she felt in the orbit. After three weeks she found herself well, except that she had lost one eye; all pain had passed away. From this time forward she never experienced hyperæsthesia, nor had she any pain in the stump arising from a blow or other injury.

Ten years after this, at the age of eighteen years, the left eye became diseased. She was told that she had "ophthalmia," and was treated accordingly, and all became right again. But since that time she has never been three months without suffering some attacks of inflammation, yet in the intervals of the attacks the vision always remained perfect. These repeated attacks of ophthalmia have continued until her admission into the Ophthalmic Institution of Brabant, where, on the 10th December, 1870, I found her in the following state:—The right eye destroyed, its place being represented by a button, scarcely exceeding in size a small shrivelled pea. Its outer coat was formed of a small globular horny skin, completely transparent, behind which I was able to perceive the remains of a small phosphatic crystalline; the impressions of the muscles were well marked, especially below and externally; the button was very soft and perfectly insensible to the touch. It had never served as a support to an artificial eye.

The left eye presented a perfect type of chronic kerato-conjunctivitis,

the palpebral conjunctiva being swollen and hypertrophied and the cornea being covered with an extensive and thick pannus that prevented any conclusion from being drawn of the state of the pupil. The vision was much impaired and peri-orbital pains were very often experienced. Having no conception that there was anything of a sympathetic nature in this case it was treated on general principles, and when the condition seemed favourable peritomy was performed, the surface being cauterized by nitrate of silver. This happened the 25th of July, 1871.

Contrary to all our expectations in regard to the benefits to be derived from this operation, which in our estimation has nearly supplanted inoculation, no amelioration took place in the state of the patient after the three months which are usually required for the beneficial effects to be produced; the cornea remained vascular and nebulous; a kind of fleshy growth which had long occupied the internal side of the cornea and extended over four-fifths of it, as well as over the sclerotic, persisted with a discouraging obstinacy. No good results followed, and after four months waiting, having absolutely gained nothing, the patient desired to leave and we did not attempt to keep her in. Her mother, however, who came to fetch her, had more perseverance and implored us to try other means. In accordance with this request, the next morning, 14th of November, we enucleated all that remained of the right eye, the operation being justified by the necessity that exists in all cases of removing the remains of the cornea, upon which we can never without imprudence apply an artificial eye. At this period the pannus was very thick, there were numerous radiating and congested vessels with conjunctival vegetations on the inner side of the cornea. Large tortuous vessels, rising from the cul-de sac, broke up at this point. She had frequent headache and peri-orbital pain, but neither the ciliary region on the right or left side presented the slightest sensitiveness on pressure. The enucleation was performed on the patient under chloroform and was marked by no incident. The results of it were really magical. The very next day the peri-corneal injection had disappeared, the corneal vessels had diminished in size; all sensation of pain had ceased, and a year had elapsed since the patient had felt so well. Was this a simple coincidence? Was it the effect of the peritomy now pronouncing itself, or might we admit unreservedly, "post hoc,—ergo propter hoc?" Most will, we think, agree with ourselves in replying in the affirmative, when they learn that this amelioration has continued, that it has made daily progress, and that three months and a half after the enucleation our patient can see to read, and has taken a place as lady's-maid, reading and sewing without difficulty.

But I have now to mention a fact which augments the interest of this

case. As soon as she had left the Institution, the patient went to a quack and had an artificial eye inserted, which she wore continually. Pain succeeded, and the interior of the orbit being constantly irritated, became inflamed; the conjunctiva infiltrated and swollen, constantly displaced the artificial eye, which she obstinately tried to retain in its place. Nor was this all; in proportion as this state became intensified, the second eye became diseased in its turn, and when she came back to us, on the 13th of January, 1872, the sight of this eye had already undergone notable diminution; the cornea had become vascular, and the peri-corneal zone had reappeared. The case had, in a word, almost receded to the point where it had been the day before the enucleation. We directed her to put aside the artificial eye; emollient poultices and fomentations were applied to the inflamed stump, and in less than a week, as the suffering decreased and the orbit recovered its normal state, the left eye underwent steady improvement, without any direct remedial treatment being applied to it.

We have here then, unless I am much deceived, an example of sympathetic ophthalmia quite different from the cases already cited, where the ciliary region was in no way implicated.

Case II. *Wounding of an eye by a shot; incipient consecutive atrophy. Sympathetic ophthalmia of the opposite eye. Enucleation of the wounded eye. Immediate amelioration of the opposite eye.*—Ch. G., farmer, æt. forty-three, is of a lymphatic temperament, and has suffered in his youth from scrofulous ophthalmia; towards the middle of August last year he was occupied in his barn when he suddenly felt that he had received a wound of the right eye. He put up his hand and felt some humour running from it; a stray shot from a gun had penetrated the globe. As soon as he had recovered his senses, he placed his hand on the other eye, and found that he was unable to distinguish anything. In the evening he was able to perceive the difference between light and darkness. The whole night he suffered severe pain in the eye and head. A physician, to whom he applied next morning, ordered leeches to the orbit and some ointment (probably mercurial); the leeches were renewed several times, and some blood was removed by venesection, on account of the intensity of the pain and the feverish re-action. It does not appear that atropine was applied.

I saw the patient for the first time, three weeks after the accident, he still suffered from pain, but nothing in comparison with what he had endured at the beginning. The whole eye was deeply congested; the cornea transparent enough and separated from the iris by a chamber, the inferior part of which was filled with blood that extended to the level of the pupil, which was now obstructed by plastic exudation. Towards the

middle of the margin of the iris and at its inferior and outer side there appeared to be a trace of the wound, which further corresponded with a mark in the cornea; the two membranes seemed adherent at this point, so far as the blood still remaining in the anterior chamber permitted any conclusion to be drawn. No pain was experienced in moving the globe and the tension was not greater than natural, but it was extremely sensitive to the touch. The patient was very nervous, which he freely attributed to the sufferings he had endured during the previous three weeks. Some perception of light was still retained; he observed luminous spots. The other eye was healthy, presenting only some old and scarcely perceptible nebulosities in the cornea. It was impossible to form any conclusion as to whether the shot was lodged in the eye or not, and still less to discern the place where it had been arrested. The movements of the eye were not painful, and the eyeball was not hard. It was quite possible that the foreign body might have traversed the eyeball and penetrated into the orbit. Yet there were evident signs of irritation in the retina, and the subconjunctival vessels were swollen and tortuous. Whatever might have been the nature of the lesion, it was probable that the eye would be completely lost. The patient even whilst under examination declared he would not submit to any operation. Nevertheless, as I could not for a long time see the patient again, I told him that, if the eye continued to be painful for weeks or months, and especially if the sight of the other eye should become impaired, or any other inconvenience were felt, he ought directly to consult an oculist. I particularly impressed upon him that in this case the removal of the diseased eye would be the only means to save the other.

I had no opportunity of seeing the patient again until the 16th of Nov., when I received a letter from his wife, telling me that the eye which had not been wounded had been suffering for eight or ten days; that the other was quite lost, and that the man was with difficulty able to guide himself. In my reply I directed her to come immediately to Brussels with him; and having satisfied himself in regard to the correctness of my prognostication, he resolved to follow my advice and soon made his appearance. On examination I found that he could scarcely see to guide himself, and that he could only with difficulty distinguish the windows of the room into which he had been led. The right eye (the wounded one) was still suffering from chronic inflammation, with uniform perikeratitic injection; the vessels towards the conjunctival cul-de-sac were large and tortuous. The cornea was transparent enough, and the iris, presenting an anterior synechia at the place of the scar of the wound, had the colour of a dead leaf, and the pupil was completely obliterated. All perception of light was lost. The globe was softer than natural, and

had begun to be squared as in atrophy generally. It was abnormally sensitive to the touch.

The left eye was injected, the redness being most marked around the cornea, which was dull and cloudy, especially below, where small interstitial points of exudation were visible. This membrane was sensitive to the touch, and had preserved sufficient transparency to enable me to perceive that the anterior chamber was of moderate depth below. In order to satisfy myself that the iris was healthy, I instilled a little atropine and found that the pupil dilated with sufficient rapidity. The proposal that the right eye should be enucleated was this time accepted without objection.

On the 20th November, having put the patient under the influence of chloroform, I effected the enucleation of the eyeball by the ordinary method. On the next day the patient rose and went to table to dine.

The extirpated eyeball was found to have preserved its globular form, though presenting manifest signs of atrophy. But what astonished me most was to find the offending foreign body fixed outside the sclerotic in the connective tissue, separating it from the capsule of Tenon. It was situated a little below the horizontal plane, about midway between the borders of the cornea and the optic nerve. The shot was about the size of a white mustard seed; of blackish-grey colour, not surrounded by exudate, and, in fact, there was scarcely any in the neighbourhood. I prepared the eyeball, by making a vertical meridianal incision in the direction of, and near the foreign body. The vitreous was diffluent; and in it were membranous shreds, perhaps the retina detached. None of these membranes, however, presented under the microscope any other elements than those of connective tissue of new formation. On the inner surface of the sclerotic and around the point where it had been pierced, there was some exudation, forming a kind of grey lamina. The ciliary body was apparently healthy, at least the pigmentation seemed regular. The crystalline lens had disappeared, or its remains were attached to the iris, which was covered by a thick layer of greyish exudate pigmented in places, and having a thickness of about two millimetres near its middle.

The day after the operation the patient was able to see clearly the light of day, and two days afterwards he distinguished his plate on the table. The vision improved so rapidly after this, that on the fourteenth day after the operation he was able to perceive the hands of a watch and the hour on a kitchen clock.

The eye was no longer painful or uneasy, and there was only slight intolerance of light. I saw him again towards the end of May. The vision had continued to improve, the cornea presenting only a little

dulness near its inferior border. And now the season becoming warmer, he began again to work. I saw him once more on the last day of May. The improvement in vision had continued, but a fortnight before, having worked with wet feet in a ditch, he took cold—a violent catarrh. This led to a severe attack of keratitis, with fresh interstitial exudation, followed by an abscess in the lower part of the cornea. The vision had consequently deteriorated, and so much the more as the keratitis was most marked towards the central part of the cornea. The condition established was evidently chronic, and I have not since had an opportunity of seeing the patient.

I will now adduce a third case, that will enable us to look at sympathetic ophthalmia from a different point of view. In this case the primary disease was of idiopathic origin, though it exerted a marked sympathetic disease in the opposite eye, which was naturally benefited by the enucleation of the eye first affected.

Case III. *Atrophy of the right eye, with ossification of the choroid, consecutive to an attack of inflammation. Irido-choroiditis punctata. Keratitis of the opposite eye. Enucleation of the atrophied eye. Great improvement.*—Madame E. D., æt. forty-one, of a lymphatic temperament, had suffered from indifferent health for years. She had an ovarian cyst of considerable size and of ancient date. She had never suffered from any disease of the eye until about ten years previously. She had then been attacked by violent ophthalmia, with swelling and suppuration (probably purulent ophthalmia). This attack proved very intractable, and the vision was only imperfectly re-established, a macula remaining at the inferior part of the eye. Such was the only positive information I could gather in regard to antecedent disease.

After a short time this eye became the seat of chronic inflammation, accompanied by headache. After several attacks had occurred vision was completely lost, and from this time onwards—that is to say, for three or four years—this eye scarcely gave any suffering to the patient; it, however, became reduced in size, and at the same time it retreated into the orbit. I was consulted by this lady towards the end of April, 1871, for the other eye, which had for several months been painful. I found she was suffering from an attack of acute parenchymatous iritis, with complete posterior synechia with exudation in the pupil; the vision was enfeebled to such a point that she could distinguish only very large printed characters. A perikeratitic zone surrounded the cornea, large tortuous vessels sprang from the conjunctival cul-de-sac, and were lost in this zone. There were signs of choroiditis, but I was unable to establish the existence of this condition by means of the ophthalmoscope on account of the lymph exuded into the pupil; there were some floating bodies in the vitreous.

The cornea seemed to be hazy towards the inferior segment, and here the subconjunctival injection was more marked. The patient assured me that the atrophied right eye had not for some time past been the seat of any pain, either spontaneous or on pressure. This eye presented a singular aspect. Besides the muscular impressions, which gave it a square form, there was at the inferior part corresponding to the position of the cornea and the adjacent parts, which were either contracted or had been absorbed, a kind of indentation, the outer border of this indentation being more elevated and more irregular than the internal. The remains of the cornea presented an ovoid form. It appeared to have become thinner, but was perfectly transparent. Behind it the iris was clearly distinguished, attenuated, of greenish-yellow colour, and presenting in places between its red striped fibres a yellowish body, resembling a phosphate crystalline, which also occupied the pupil. The tension of this eye was below par, except that the finger perceived a certain resistance towards the lower part of the external indentation, where, however, it was impossible to recognise any irregularity on account of the nervousness and pusillanimity of the patient. I took great care to make my questions precise, in order to satisfy myself that this eye had never been red or painful. The patient persisted in replying that for a long time she had not remarked anything of the kind. Yet I was not certain whether the fear of a formal proposition of enucleation, which I and a confrère who had previously seen her had imprudently alluded to, prevented me from obtaining more precise answers. In short, the patient declared that she had not suffered from this eye, and was quite resolved not to have any operation performed upon it. I determined therefore to treat the left eye whilst keeping the right under observation. I commenced then active treatment with calomel, local abstraction of blood and derivatives, together with frequent instillations of atropine. At the end of three or four weeks the violence of the attack had diminished, so far at least as regarded the iris; some of the adhesions broke down, and the iris, previously arched forwards, became level; at the same time the symptoms of inflammation of the choroid disappeared, and only the nebulosity of the cornea remained unaltered, or had even increased in size. The improvement remained persistent for some time. During the summer however, several relapses occurred, which were always reduced by the same treatment. Meanwhile the cornea was invaded more and more by the exudation, and the punctated appearance became more pronounced in the interior segment. These relapses coincided regularly with the menstrual epochs. The atrophied eye remained unaltered, except that on one or two occasions it presented during the attacks a little redness, and became unusually sensitive. As, both in my own opinion and in that of a

confrère who saw the patient with me, there was some indication of former specific disease, it was resolved to administer syrup of iodine and iodide of mercury. Under the influence of this treatment, persisted in for two months, the state of the eye rapidly improved, and after the lapse of about three months led us to hope that the case was cured. At this time, however, the atrophied eye began to be occasionally painful, and when it was touched through the upper eyelid she drew back as far as possible. Very soon the iris and the choroid of the other eye were again attacked by inflammation, and interstitial exudation again appeared in the cornea. From the first symptoms of irritation in the atrophied eye I had expressed myself strongly in favour of enucleation, and at last persuaded her to submit to the operation. It was accordingly done on the 18th December. The extirpated eye was found to be considerably diminished in size and deformed. Apart from the muscular impressions and the indentations already referred to, it presented a kind of staphylomatous protrusion above and on the outer side, between the insertion of the right inferior rectus and the external rectus. But what was more remarkable than this deformity was the discovery of a hard body within the eyeball, situated near the superior projection and the surface, which formed the external side of the inferior indentation. Besides this, the eye was soft, at least at its surface, though when a little firmer pressure was applied a hard body could be felt. I then made a small opening on the side opposite to the hardness. A turbid and yellowish, but not viscous, liquid escaped. The interior was still pigmented in certain points, but was generally of a dull grey colour, with a bluish reflex. I found no trace of retina nor choroid. The optic nerve was reduced to less than half its natural size, and was atrophied and cupped. The crystalline lens occupied its ordinary position, and was completely hard and calcified, though softer behind, where it was covered either by its own thick capsule, or by lymph. Immediately under the sclerotic, but separated from it at certain points by a little pigment, was the hard, irregularly shaped and vascular body, which was felt through the sclera, and which was no doubt only an ossification of the choroid, an ossification resulting from chronic inflammation, and dating back to a long antecedent period. The irregular mass distantly resembled the shell of a hazel nut, the base of which was below, whilst the apex corresponded to the upper staphylomatous projection. Let us note in passing that it was the contact with this last projection which had latterly rendered any pressure so painful. Moreover, it was towards this side, as well as towards the interior, that the growth of the bony projection had chiefly taken place, for it was there that it was the least dense, whilst it was most condensed and presented fewer pores and vessels towards the inferior and outer side. Under the micro-

scope I found very well formed bone corpuscles, and even canaliculi, which radiated from them with regularity. In short, the whole presented great similarity to the bony spicules which are formed round joints or in bones that have long been subject to disease. The next day after the operation the other eye presented less redness, and a better aspect. After a few days the patient could distinguish objects which she had long been unable to see, and at the end of some weeks the vision of this eye had become better than during the months of September and October, and the patient considered herself cured. At the present date all exudation into the cornea has disappeared, and this membrane has become perfectly transparent. Nevertheless the pupil is immovable, for it is everywhere attached to the crystalline. The perikeratitic injection has not again made its appearance, and the subconjunctival vessels have resumed their ordinary size. In short, the external shell of the globe is in the best condition, and the process of recovery has been maintained up to this time.

From these facts I draw the conclusion that any chronic affection of one eye, be it caused by traumatism or disease, from the moment that it is accompanied by persistent hyperæsthesia, whether spontaneous or induced by irritation, and whatever may be the part affected, can occasion by sympathy various manifestations of disease in the opposite eye. If the vision be irremediably lost, the indication for enucleation is in such case indubitable. I maintain further that these radiating sympathetic affections can equally originate from a lost eye or from a perfectly indolent stump. I have a case where these symptoms are present—and which is under treatment while I am writing these lines—an old soldier, on half-pay since 1857, on account of the complete and irreparable loss of his left eye, the right eye being healthy. The left eye, lost by injury, is no longer visible except as a deformed, hard, and large stump, which, however, is perfectly indolent, though feeling hard and stony. This man has now been for more than six months under my treatment for serious ophthalmia of the right eye, which has resisted all remedial treatment. Occasional temporary improvement takes place, but I expect from day to day to see a relapse, and I am quite resolved to meet it by resorting to the enucleation of the stump, which evidently plays an important part in the production of the symptoms presenting themselves in the sound eye.

From all this I believe myself to be justified in making the following propositions:—1. When an eye, lost by injury or disease, or even when the stump which represents it, is the seat of continuous or intermitting hyperæsthesia or of inflammation, either of an acute or chronic character, it is capable of setting up sympathetic mischief in the other eye. The

sympathetic affection may manifest itself even in the absence of all perceptible irritation of the organ originally injured. In both cases enucleation is indicated. 2. It is important to perform this operation as soon as possible after the manifestation of the first symptoms. When the sympathetic irritation has already advanced to an irido-cyclitis with exudation, enucleation is almost always useless, for it is slow in progress. 3. When an eye is destroyed by injury, we should at once proceed to enucleate it under chloroform, for we thereby render a great service to the patient, freeing him, on the one hand, from the immediate effects of the injury, as ophthalmitis, &c., and enabling him to return to his work on the next day, if we may so speak; and on the other, certainly preserving him from all consecutive sympathetic mischief. This preventive enucleation ought always to be recommended when there is reason to suspect the presence of a foreign body in the eye.

I desire M. Donders to submit these propositions to the Assembly, and if they give their sanction to them, these precepts will I think be useful. The question is indeed of great importance in different points of view, especially in medico-legal cases and in the responsibilities of military service. Thus in Belgium a soldier losing an eye in the service, if the other eye is good at the time of discharge, the lost eye is paid for and all is done. But when later the second eye be attacked, it is obvious how important it would be to him were he able to establish the connexion between the two affections. I think the members of the Congress may, without compromising themselves in any way, express their opinions in regard to these propositions. I do not ask them to vote on a scientific question, but on a practical point in regard to which the actual state of science allows them to express themselves positively. Fixed rules, decreed by them, would serve as a useful basis for many judicial decisions, which has hitherto been wanting in this matter.

M. Donders: M. Warlomont has made a proposal which appears to me to be very dangerous. It is to submit to the vote the propositions we have just heard, but this is a proceeding which I think the Congress cannot readily adopt. Perhaps M. Warlomont will be satisfied if no one raises any objections to his propositions. Does any one object to them? (Pause.) Well, then, it may perhaps be admitted that no objections readily occur to any member of the Congress on these points, and M. Warlomont will readily understand that this is all that can be conceded to him at present. M. Warlomont will perhaps again read his three propositions.

M. Warlomont read them in French and English.

M. Carrera: I quite agree with the two first propositions, and I even admit all three in part; but it appears to me that the third ought to be divided into two. I would insist on the operation of enucleation in all cases where there is a foreign body in the eye, but I would wait for the further development of ophthalmology before insisting upon it in all cases in which the eye has been punctured by sharp instruments.

M. Warlomont: Sig. Carrera has not quite understood the drift of my third proposition. Permit me to read it again (M. Warlomont then read the third proposition). It is only when all chance of recovery is gone, when in fact the eye is destroyed, that I would enucleate.

M. Wecker: I am of opinion with M. Warlomont that it is important the indications for operation should be determined with greater precision than at present. Every one will agree with me that it is extremely dangerous to do these operations without regard to the time that has elapsed. If twenty-four or thirty-six hours have passed it is necessary to exercise great caution. When suppuration has commenced it would be very dangerous to extirpate the eye. If the wound is such that the eye must be taken out, then it ought to be done immediately after the injury.

M. Warlomont: That is clear. I have already stated that this ought to be done.

M. Hansen: The propositions laid down by M. Warlomont are in favour of the extension of the limits within which the operation of enucleation should be practised. In my opinion, however, such a step is by no means advisable; on the contrary, I think it would be decidedly preferable if the indication for enucleation could be more limited. It is a dangerous theory to hold that one eye should be removed for fear the other should become sympathetically diseased, and I am decidedly opposed to the practice of enucleation of the injured eye in such cases. The sympathetic affection is a possibility, but by no means a certainty. Tenderness and pain in the ciliary region, and other analogous symptoms which we are accustomed to regard as dangerous, might indeed render an operation imperative.

M. Warlomont: I quite understand the objection, but I at the same time declare that if I had such an injury myself I would undergo the operation I have proposed.

Mr. Critchett: The question of advisability of enucleation in traumatic cases is the most difficult that can be proposed to us; it is so difficult, that in point of fact it is impossible to lay down any rules that can be followed in every case. If inflammation is caused in the eye not affected, it is very probably caused by sympathetic action; prolonged irritation will certainly cause the loss of the uninjured eye, and the question is what is to be done in these critical cases. We cannot give in answer that the operator must adopt one general method alone. Each case must be considered on its own merits, and the arguments *pro* and *con.* be balanced. There are cases, and many could be cited, where enucleation affords the only chance for the patient. I shall not attempt to lay down any rule, or indicate the symptoms which require the application of this or that proceeding. I would only observe that in all these cases it is necessary to think well before operating. At the same time broad distinctions may be drawn, and I should make a difference in the treatment of a young person and one of advanced age. Complete enucleation is not always necessary; we may perform ablation, and I should adopt partial ablation, and not complete enucleation, in the case of young persons. In regard to the observations that have been made on the subject of suppuration, I am of the opinion of M. Wecker, that in cases where we have to combat inflammation it is generally sympathetic.

Dr. Noyes: I do not propose to discuss the propositions of M. Warlomont, but to mention my experience in reference to the cases of suppuration of the eye. I have adopted another proceeding for the purpose of relieving the sufferings to which the patient was exposed, and at the same time preserving a better cosmetic condition for the adaptation of an artificial eye. I have contented myself with simply freely incising the globe and letting out its contents, and with a sponge wiping out everything pertaining to the eyeball save the cornea and sclera, leaving thus open the cavity of the sclera, which gradually granulates together, forming a stump which is certainly better than the entire absence of the globe. None of these cases have ever come to me again with sympathetic trouble, and I quite agree with the proposition that suppuration of the eye is unlikely to cause sympathetic affection, but I think this proposal to eviscerate the eyeball so suppurating is worthy of adoption where a good cosmetic effect is afterwards desirable.

M. Chirált: I am pleased to find that M. Warlomont has not omitted to regard this question from a medico-legal and military point of view. I am of opinion that enucleation should only be performed in cases of foreign bodies in the eye and in those of traumatic irido-choroiditis.

M. Donders: I must now close the meeting. It is a very interesting discussion, but it cannot be put to the vote; in the afternoon, if desired, the discussion can be recommenced.

Thursday, August 1.—*Afternoon Sitting.*

M. DONDERS IN THE CHAIR.

Mr. Bader : The first case I wish to show is one of pannus with granular ophthalmia, treated by the local application of sulphate of quinine, which was powdered over the granular surface of the conjunctiva. The immediate effect of this proceeding is to cause a profuse suppuration, which lasts from one to three or four minutes. After that has subsided there is no more inconvenience. Here is a case which was such as I used formerly to inoculate with gonorrhœal matter, the papillæ being highly hypertrophied and the cornea vascular, so that no iris was visible. The patient could not see his way about. I tried the effects of quinine upon him in the mode described, and in about three weeks he became able to see to go about. I have here a sketch of the state of his conjunctiva when he came into the hospital. If you look at him now, you will see that the cornea is clear, and I believe that by persevering he will get well. Quinine seems also to do good in cases of intolerance of light when caused by granular deposit, whether in clusters on the cornea, or granulations on the conjunctiva.

Mr. Bader then brought forward two cases of conical cornea, and said : This first patient came to me in February, 1872, with conical cornea in both eyes, and I show the case in order to bring before you the result of tinting in cases of corneal opacity. You will have some difficulty in detecting the existence of any corneal opacity, although there is one as large as two pins' heads. It has been tinted with Indian ink. The second case is one of conical cornea, in which the sight of the patient has become so good that she will not allow me to remove the opacity by tinting. She came to me originally with myopia of one half. No concave lens improved her. She could not work, or even see to go out. The right eye, the worst, was first operated on. It quickly cicatrized—in about three weeks—and three weeks afterwards the second eye was operated on. She has been in service now for several months, and she can read Snellen's No. 2 at twelve

inches. There is still a good deal of astigmatism, but she does her work without the consciousness of anything being wrong. If you will allow me I will describe the operation. It consists in cutting off the apex of the cornea. How it is cut off is immaterial. I used to take a cataract knife and make a flap section, take hold of that with forceps and then cut through the remaining part with scissors. A piece came off about the size of a pin's head. Thus an opening was cut into the anterior chamber, the aqueous humour escaped, the eye was then bound up and kept bound up until it had healed. The peculiarity of these cases is that we cannot say how much improvement will result. I have had seventeen cases, and all are so much improved that I shall always adopt the same operation. In some cases it happens that after the wound has healed up, a slight amount of myopia remains; in this case it amounted to $\frac{1}{10}$th. In some cases a high degree of hypermetropia was the result. In the cases on which I operated first I used to stitch up the opening with a fine suture. This case is the first in which no sutures have been inserted, and it is the most perfect case of all. Since this one I have had several cases in which I did not use sutures.

In reply to the President, Mr. Bader said that he had sometimes to perform an iridectomy afterwards, but in many this had been done before the case came under his notice.

In answer to Mr. Cooper, he said that he had had no case in which the lens became opaque.

Mr. Critchett: I think the subject of conical cornea ought not to be allowed entirely to drop without once more rendering homage to our revered colleague, Von Graefe, who was the first to suggest the treatment of the affection by treating the cone itself, and I believe it was the subject of the last communication he gave to us. Although the treatment has been modified in various ways, yet the idea originated with him. I have a case here which illustrates, I think, very well the plan which he himself proposed to follow, and shows that there are several ways which lead to the same result. I quite admit that when put into comparison with the very beautiful case I have just seen of Mr. Bader it does not in all respects bear comparison. When it has been treated by tinting I think it will be greatly improved. A thin layer of the centre of the cone was removed without entering the anterior chamber. The wound was then touched

with nitrate of silver, which formed a considerable ulcer, that afterwards contracted, and, as it contracted, completely removed the apex of the cone, and reduced the curvature of the cornea. The ulcer being, however, the same size as the pupil itself, it was afterwards necessary to make an artificial pupil, which was done by iridodesis ten days ago, and he is now able to read No. 2 of Jäger and No. 2 of Snellen with a $\frac{1}{10}$th concave.

In reply to a question by the President, Mr. Critchett said that the idea of Graefe was to take off a thin shaving of the cornea without entering the anterior chamber, and then to apply nitrate of silver to the scar, thus producing an ulcer, which afterwards healed. The great difficulty of the operation is to avoid entering the anterior chamber, and it requires perhaps more dexterity than any other operation.

Mr. Soelberg Wells: I have done the operation for conical cornea, and I agree with Mr. Critchett that it is one of the most difficult operations we are called upon to do. It has lately struck me that we may perhaps attain the same end by a more simple and safe method, by doing what we are often called upon to do in removing a foreign body—namely, merely scraping off with a knife a sufficient quantity of epithelium and a little corneal substance, and then touching it with a stick of nitrate of silver. In that way we can exactly estimate the size of the ulcer we wish to produce, and we run no risk of perforating the cornea. I have not had an opportunity of performing the operation, but shall endeavour to try it when a suitable case presents itself.

Mr. Hulke asked if he was correct in understanding Mr. Bader to say that the immediate effect of the application of quinine was to cause suppuration, lasting four or five minutes only.

Mr. Bader: Such is the case, and I believe that that is really the reason why the cases get well so quickly.

Mr. Hulke: In what proportion of Mr. Bader's cases of conical cornea has there been prolapse of the iris and anterior synechia, and may it not be that in many of the cases the improvement of sight has been the effect of some alteration in the shape and position of the pupil rather than of the reduction of the conicity of the cornea?

Mr. Bader: In none of the cases in which no suture was used was there any adhesion or prolapse of the iris. When I used a suture I got prolapse of the iris and did an iridectomy

afterwards. In some cases the iridectomy had been performed previously at another hospital.

M. Delgado: May I ask Mr. Bader whether he has obtained a complete cure of granular pannus by treatment with sulphate of quinine alone, and has he seen both the opacities and the vessels disappear?

Mr. Bader: My experience has not been sufficiently great to enable me to reply to you, but I would observe that the sulphate of quinine certainly causes the photophobia to disappear at the end of three days, which gives time for the granulations to be otherwise acted on.

Dr. Williams (of Cincinnati): The case of keratitis treated by sulphate of quinine is one that interests us who come from a country where such diseases are very common. I have examined the two eyes treated, the one, as I understand, exclusively by quinine, and the other by caustics of various kinds. I understood Mr. Bader also to say that he had treated them with the sulphate three times a day for a year. (Mr. Bader, nine months.) This is hardly enough to induce us to decide on the propriety of the treatment, for we often see that of two eyes of an individual one will remain stationary, while the other, under the same treatment, will get well. The treatment of such granulations for nine months without producing more impression than is produced on the one eye does not seem to me, under the best view, very encouraging. I have used the sulphate of quinine both in substance and in solution in many cases for some time since it was first proposed, and I must say that I have been disappointed in its effect, and I have gone back to other modes of treatment, about which I shall speak to-morrow. I am convinced that taking that case, and treating it with sulphate of copper, or nitrate of silver, or chromic acid, brushing the lids once a day for three months, they will be rendered smooth without any destruction of the conjunctiva. In a case of conical cornea I did Mr. Bader's operation on one eye, and on the other eye of the same patient I did Graefe's operation—the latter eye being the worst. I excised a thin layer of the cornea without opening the chamber, but did not cauterize it. I used compression for a few days, and the eye recovered so far that the patient was able to read ordinary print at five or six inches distance, while before the operation she was hardly able to read very large print even when touching her nose. In the other eye, in which Mr. Bader's operation

was done, the aqueous escaped, the eye was bandaged, and there was no prolapse, yet, although I did not excise a large piece, the wound remained open for six weeks. I had complete anterior synechia of the entire pupil, and the patient suffered severely the whole time. I have made an iridectomy, which has relieved the condition of the eye, but that on which I operated by the other method, although the worst originally, gave me least trouble and the best result. Thus I think we shall have to come back to the method of our immortal Graefe.

M. Galezowski: In granular keratitis I practise excision of the superior or inferior cul de sac of the conjunctiva, according to the lid affected. Three days after this operation has been performed I cauterize the eyelid with sulphate of iron, and I find that by these means the cornea becomes clear, and that granulations which have resisted every treatment for years heal in three, four, or six months. With regard to kerato-conus, I have twice done an operation, which consists in making a small inferior flap very near the apex of the staphyloma. I then cut away a small semicircular-shaped piece, corresponding in length to the wound, and apply compression for two or three weeks. By these means I obtain excellent results. In one of my cases the invalid could read No. 5 of Giraud-Teulon's test types, and in the other No. 7, although the wound was not then perfectly healed.

M. Donders: The next paper is by Dr. Taylor.

On the Prevention of Prolapse after Cataract Extraction by Separating the Iris from its Peripheral Attachment, instead of Removing a Segment of that Membrane.

By Charles Bell Taylor, M.D., F.R.C.S.E., *and Surgeon to the Nottingham and Midland Eye Infirmary.*

In spite of the almost universal performance of an associated or preliminary iridectomy as a part of the modern method of extraction for cataract, I think it is evident that no method will be permanently retained that involves a mutilation of the pupil. The cosmetic defect, the dazzling and the defective accommodation occasioned by the sacrifice of a portion of iris, though defects perhaps little to be considered when we appreciate the comparative safety of modern methods of extracting, are still defects which leave something to be desired both on the part of the patient and operator; and it is clear that while this is the case we must constantly expect a restless aspiring after improved methods and a constant effort to save the pupil; it may be, I grant, at the sacrifice of more

important considerations. The existence of this feeling is evidenced by a remark emanating from Professor Stromeyer, who, in his lectures on the surgery of this country, called attention to the efforts made in this direction by Mr. Critchett and Professor Liebreich, saying it was evident from what he had observed of the practice of English ophthalmic surgeons, "that we ought to save the pupil;" and a similar sentiment is manifest by the frequent reversion to the old flap operation, in spite of its attendant dangers, by some of the most distinguished operators of the present day.

Before the adoption of Mooren's, Von Graefe's, and other modern methods of operating, prolapse of the iris was always considered the bugbear of extraction. Owing to the labours of these and other ophthalmic surgeons we have been enabled to secure immunity from this danger by the sacrifice of a whole segment of that membrane, and the question that presented itself to my mind was whether the same end might not be attained at less cost by merely separating the iris from its periphery, removing only the smallest possible portion that would enable us to do this without invading the pupil, and then extracting in the usual way. This end I have accomplished. 1st, by contracting the pupil with Calabar bean; 2ndly, by making an incision at the summit of the cornea in the corneo-sclerotic junction, about two lines in extent, with the small knife I always use for extraction; 3rdly, by pinching up a minute portion of iris, and snipping it off as close to the periphery as possible; 4thly, by lacerating the capsule with a pricker inserted into the pupil through the incision thus made; 5thly, enlarging the wound sufficiently to permit of the exit of the lens; 6thly, by inserting one blade of a fine pair of iris scissors into the aperture already made in the iris and separating it from its peripheral attachment; and 7thly, by extracting the lens at the back of the pupil in the usual way.

I have performed this operation upon ten patients taken as they came without selection. Three were decidedly unfavourable subjects, and one other, who was in his eighty-fourth year, was specially unpromising, as he had recently lost one eye from asthenic ulcer, and had been blind from cataract for fifteen years in the other, which also presented the complication of obstructed lachrymal duct and granular lids. Nine of these, including the patient just alluded to, recovered without bad symptoms, and one had a severe attack of iritis, followed by closed pupil. One of these, an average result, certainly not the best, I have the honour to show you. The objections to the operation are, that it is tedious and difficult, requires prolonged anæsthesia, and that it is sometimes impossible to excise a portion of iris without invading the pupil. I am in hopes, however, that by making the incision of the iris a preliminary step, that some of these difficulties may be overcome.

Dr. Taylor, in answer to a question, said that it was necessary to make a very small incision at first and to enlarge it afterwards. Ultimately the new pupil was scarcely to be seen, being merely a little gap at the periphery. The original pupil became quite natural, and was not displaced at all.

In reply to Mr. Jabez Hogg, he said that the early escape of the aqueous humours did not interfere with the subsequent steps of the operation.

Mr. Critchett: Is the capsule opened behind the iris or through the natural pupil?

Dr. Taylor: Through the natural pupil.

Mr. Critchett: Then the part of the capsule corresponding to the escape of the lens is not opened. Would not the capsule remain as a barrier to its escape?

Dr. Taylor: Not more than in ordinary extraction.

Dr. Wolfe observed that this operation was the old story of trying to force out the lens through a small opening which is not dilatable, and he believed it would be far better to force it out through the dilatable natural pupil. Another objection was the difficulty of making a hole in the iris of the proper size. He believed the operation was an unnecessary complication in the operations for cataract.

Dr. O'Leary remarked that a hole of considerable size, while the iris was contracted by Calabar bean, would shrink to insignificant dimensions when the effect of the Calabar bean had passed off.

The next paper was by Dr. Bribosia, and was entitled—

Modifications proposed for adoption under certain circumstances in the Operation of Cataract by Linear Extraction.

By Dr. Bribosia, *Surgeon to the Ophthalmic Institution of Namur (Belgium).**

Amongst all the operations performed on the eye none has received more earnest attention from medical practitioners than that of removal of cataract. After but a short contest linear extraction combined with iridectomy has become the method universally adopted, and it is only right to state that the profession owes, to a considerable degree, the first steps in the path of this progress to an Englishman. If the operation of cataract,

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* Translated by Mr. Vernon.

as now practised, bears with justice the name of the celebrated and lamented Von Graefe, it is an incontestable fact that the merit of originating or promoting the idea of linear extraction belongs to one of the most eminent men of your own country, one of the best names in the profession, Mr. Critchett. As the operation is now performed we might be tempted to believe that no greater perfection can be attained, and that the last words have been said on the subject. Several attempts have indeed been made to improve upon Von Graefe's method. I have tried them all myself, including the process suggested by our confrère of Aberdeen, Dr. Wolfe, who performs iridectomy six weeks previous to the extraction of the lens. Without discussing the value of these experiments, I think that very few practitioners who are accustomed to Von Graefe's method will be inclined to change it in a hurry, even for the promise of an amelioration which all may desire. We have not had much encouragement so far to try the various modifications proposed in linear extraction.

Will it be the same with the plan which I have the honour of submitting to this learned assembly to-day ?

However this may be, I can safely say that the process in question, applicable as it is to certain special cases, has been eminently useful to me in circumstances of a peculiarly critical nature. On this ground I venture to think that a brief exposition of it may not be out of place here. I will endeavour to be as concise as possible, and to economize the moments, always too short, of your ophthalmological conference.

The causes of failure or imperfect success in the operation of cataract by modified linear extraction may be summed up under two heads—namely, those that occur during the operation and those that supervene afterwards. If the latter are less frequent since the employment of the new method, we cannot say as much of the former. Amongst these I need hardly to remind you we have the escape of the vitreous humour, the contusion, the pulling, the injury of the iris. There is besides, the critical moment of iridectomy, a very delicate part of the operation often imperfectly performed, on account either of the effusion of blood in the anterior chamber (the consequence of the section of the eyeball) or on account of the movements of the eye itself. I refer to the division of the capsule, and it is here, as you are aware, that an imperfect operation often induces secondary cataract.

Under this conviction I have attempted to modify the process in the manner I am about to describe. Circumstances of a purely accidental nature led me to the first trial, and since then numerous results have justified its use.

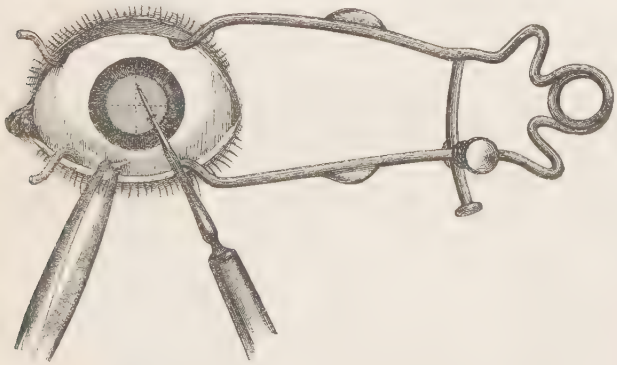
I was called upon one day to perform the extraction of a cataract on a patient of excessive nervous irritability, and whose eyes were very deeply

set. To add to the difficulty, it was impossible to obtain anæsthetics; the agitation of the patient was only increased by chloroform. In the face of such unconquerable indocility the situation became a serious one. The moment of iridectomy and that of opening the capsule were especially fraught with danger, rendered still more complicated by the depression of the eyes.

The following process was then carried out; its result was a complete success :—

1st step.—The patient lies down (his head resting on a somewhat hard pillow), the pupil being pretty fully dilated and the conjunctiva seized by the forceps; one of Mr. Bowman's very fine stop-needles is introduced rather obliquely through the cornea into the anterior chamber (about three millimetres from the corneo-sclerotic margin), and a little

Fig. 1.



below the transverse diameter ; a crucial incision is then made through the capsule; this is done very rapidly, to avoid the escape of aqueous humour.

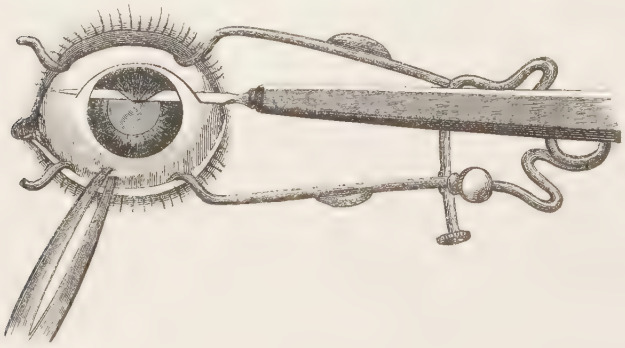
2nd step.—Immediately afterwards one of Graefe's very slender knives is introduced, according to his ordinary method of upper incision. Puncture and counter-puncture are rapidly performed, after which an instant of repose is allowed. The operator then communicates to the knife a few slight rotatory movements on its axis, which facilitates the escape of a certain quantity of the aqueous humour. This manœuvre brings in front of the blade of the instrument the portion of the iridian veil which overlies it, a portion more or less considerable according to the quantity of the liquid which has been allowed to escape before continuing the operation.

3rd step.—The middle part of the blade of the knife, which is in the

anterior chamber, finding itself thus hooded or covered by the corresponding medium portion of the iris, the section of the eye is completed as in Graefe's operation, and the surgeon cuts before him both iris and sclerotic. Under circumstances of a peculiarly difficult nature, such as the movement of the eye or other causes which might lead to the escape of vitreous humour, it would be advisable to leave the middle part of the conjunctival flap to a small extent uncut, as several surgeons do. Afterwards, if the density of the lens renders it necessary, the section of the conjunctiva may be completed with blunt scissors, a precaution which increases the security so much wished for in such an important operation.

4th step.—This last step is identical with that employed in the process of the modified linear extraction. The lens, expelled by the *slide manœuvre,* drives before it the fragment of the iris which has been cut. It is seldom necessary to introduce the forceps to take it out of the wound. I have often observed that the lens will expel itself, so to speak, im-

Fig. 2.



mediately after the section of the globe, owing to the elasticity of its envelopes, and without any pressure being required. It is necessary for this that the incision should be large enough—a well-known condition always essential to insure a satisfactory result. Should this not be the case, the operator should at once increase the size of the incision by means of small blunt scissors curved on the edge. As for the clearing away of any softened cortical substance that may still remain in the eye, it is effected by the usual means. Care is taken afterwards to draw down from the cornea the conjunctival flap so useful to the rapidity of the cure. I will now add a few words on the manipulation of this process.

Without pretending to apply it to all cases indifferently, I confess that I believe the plan likely to be eminently useful in certain cases,

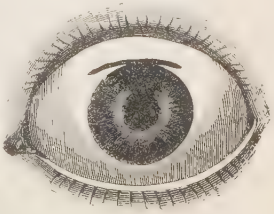
and I trust that for such cases the distinguished colleagues who listen to me will give it a favourable reception.

Returning once more to different stages of the operation, we will briefly notice the advantages they respectively offer.

1st. The opening of the capsule performed in the first instance with the stop-needle possesses the advantage that it can be executed in the most complete and finished manner. The operator is not impeded by the presence of blood, which frequently occurs in Graefe's process after the section of the sclerotic, and iridectomy. In the ordinary linear method, to perform this discission while there is a gaping wound in the eye, requires great docility and perfect calm on the part of the patient. Besides this, the crucial aperture of the capsule with the stop-needle is more easily performed, than by the introduction of the cystitome into the upper part of the anterior chamber, as is practised in Graefe's method. Have we not all experienced difficulties at this stage of the operation? The oblique incision of the capsule in the shape of a V, as practised by the Berlin oculist, is an easy matter certainly. But the transverse openings, so desirable to prevent secondary cataracts, are not so soon executed. This, however, is not my principal motive for altering, in certain cases, the epoch of opening the capsule. The strongest reason for its adoption exists when we have to deal with an unmanageable patient, and must expect spasmodic movements and agitation of the eyeball. In such cases, as you are well aware, the movement is a critical one. The eye is open, the wound often gaping; and the slightest movement of the eyeball may give rise to an escape of vitreous humour.

2nd. Iridectomy performed simultaneously with the opening of the eye. The idea of making the excision of the iris with Graefe's knife at the same time that the globe of the eye is cut must have presented itself to many of you. Every operator, indeed, accustomed to the linear extraction must have sometimes found the iridian diaphragm meeting his knife, and have been forced to continue the operation by excising it at once. For my own part, I do not consider that traumatism of the iris thus performed presents any greater danger than when done in the usual way with scissors and forceps. It is true that in ordinary cases it is better to act according to Graefe's rules, which give a neater wound in the iris and allow us to measure more easily the portion to be excised. But experience has convinced me that iridectomy performed with the linear knife at the same time as the sclerotic incision, notwithstanding its fringed shape (fig. 3), does not

Fig. 3.



present any danger or difficulty. Further, it appears to me to enable the operator to carry away more completely the great circumference of the iris, a point so strongly insisted upon by the lamented professor of Berlin.

After this double incision nothing more remains to be done except to press slightly in order to force out the opaque lens, when its exit does not take place by itself, as aforesaid. I have no hesitation in asserting that any operator who has recourse to the modifications which I have performed and proposed, when dealing with indocile patients or with those whose eyes are deeply set, will be able to congratulate himself on the results.

It cannot be objected that the introduction of the stop-needle is a needless increase of traumatism in the first stage of the operation. Every one is aware that nothing is more harmless than keratonyxis.

There is, however, one objection to the process recommended above, and it is this:—

In the first stage of the operation, at the moment of making the corneal incision, there is sometimes an issue of aqueous humour, which for the time effaces the anterior chamber and renders it impossible to proceed to second stage by using the knife. To meet this difficulty I advise, as I have before, the employment of the finest possible, and rather conical, stop-needle, and its introduction in an oblique direction. If, after these precautions, there is still some escape of the aqueous humour, it is easy to wait awhile for its reproduction, a very rapid process, as you are well aware.

I conclude, gentlemen, by repeating that I do not pretend to substitute my process in the majority of cases for that of the linear extraction, as commonly performed by our best oculists. I merely suggest an inversion of the ordinary stages of this method in peculiar circumstances. I venture to flatter myself that my suggestions will not be deemed unworthy of the consideration of the learned audience which I am addressing on the ground that they are likely to prove useful to the profession in special cases. I am well aware that I speak in the presence of veteran practitioners, to whom the difficulties of an operation are as nothing; but at the same time I know that there are many young surgeons whose want of experience may be powerfully assisted by any modifications which tend to diminish difficulties and to avert dangers.

We must all acknowledge that, while Graefe's method has improved vastly upon the old keratotomy, it undoubtedly demands more skill in its execution, and it presents some very critical moments, such as those of the iridectomy and of the opening of the capsule. It is precisely these

two steps which I have sought to render easier for the operator and less perilous for the patient.

In consequence of this, I recapitulate the advantages of my plan as follows:—1. Facility and rapidity of execution, the eye being throughout fixed by the operator himself. 2. The opening of the capsule performed with more thoroughness and neatness. 3. Less frequent escape of the vitreous humour, on account of the rapidity of the operation. 4. Adaptation to persons of a nervous and susceptible temperament, whose docility cannot be depended upon, as also to those patients whose eyes are very much depressed in the sockets.

Mr. Hogg remarked that the operation possessed the same disadvantages, in allowing the early escape of the aqueous, as Dr. Taylor's.

A New Method for the Extraction of Cataract.

By Dr. Warlomont.

The history of the extraction of cataract is a strange one. Originally performed by Daviel, in the year 1748, it took a century to perfect. To attain this perfection the ancient methods of reclination and of depression, of which happily nothing remains now-a-days but the sad remembrance, were successively adopted and discarded. In possession during twenty-five years of the exclusive favour of all ophthalmologists, it was widely spread and universally accepted as the best method; from 1840 to 1865 the extraction by the large flap was the general method of operating on senile cataract. The operators disputed timidly respecting the place to be selected for the section, some cutting upwards, some downwards, and others again on the side, but this little question of detail settled, the operator hesitated no longer. A senile cataract being given, a large corneal flap was made, and each step of the operation was mathematically laid down. The starting-point was indeed known, but the method had been determined upon and hesitation was impossible. The patient was certain that he was about to be operated on by the best method known, whilst the practitioner felt that this method alone could lead to a successful issue.

Great changes have occurred in the course of a few years; innumerable modifications were made in the operation of Daviel: extraction by means of the large flap was discarded for a time by the proceeding of linear incision, which though resisted by some obstinate adherents of the old method was warmly approved of by others. This was the commencement of a period of indecision and perplexity. But now, having

given up the large flap, let us devote ourselves to the consideration of the linear section, which is both the most recent method and the most satisfactory in its results; for it must be admitted there is no other so generally accepted, nor one which avoids so many of the dangers that stand in the way of the operator who is called upon to extract a cataract. We must acknowledge the proceeding of Graefe has been authoritatively substituted in the place of the method of Daviel, though the innumerable improvements which each operator has suggested, suggests, or will hereafter suggest in it, indicate that the method of the illustrious oculist at Berlin has not arrived at the state of perfection generally admitted. What answer do we get from the most eminent ophthalmologists when you question them on the proceeding which they actually profess? Nine times out of ten you receive the answer: "I operate always by the method of Graefe, but with some modifications." Why all these modifications? Doubtless because the new method is not altogether satisfactory. It is a thousand times preferable, you are told, to the plan of making large flaps; but it leaves still much to be desired. Here we are then very far from the beaten track we formerly followed when all our resources were expended upon the one method at our disposal. Now we have the choice of several methods of operation. Where is the operator that holds by the old method of making large flaps? And yet there remains only the plan of linear extraction. Which? That one of Graefe? Doubtless. But with the modifications recommended the day before by Mr. This or Mr. That. The perplexity is great, I assure you. The conscientious surgeon must choose the surest method. But which is the surest method now? We practise them all. Must the incision be made high or low, to the right or left, in the cornea or in the sclerotic, that is to say, in the ciliary region? Must we perform an iridectomy at the same time, or is it unnecessary? In the first case must it be large or does it suffice to remove a small portion of the sphincter "Tot capita, tot sensus?" Under such circumstances we may fairly say that the most complete anarchy reigns at the present time with reference to the choice of extraction, seeing that every one operates according to the dictates of his own fancy, following a more or less eclectic philosophy, and that altogether we live in a time where, in default of fixed rules, we must rather seek to obtain the greatest number of good results than to follow one uniform method. No one method has as yet after mature judgment been proclaimed the best, but only the method that each one can best carry out. We have then no fixed rules. There is not a point in the cornea that has not been announced in its turn, as deserving the preference to the rest of the surface. It is not even decided whether an iridectomy can be

dispensed with, or whether we are interdicted from leaving the pupil intact, even with the smallest cataract.

This state of things encourages me, gentlemen, to lay before you the plan of a new method of proceeding; the need of it, as you know, being felt by all, gives me, without affecting pretension, a vague hope, whether rightly or not you shall judge, that it may deserve a high rank in the future operations for cataract. This proceeding, due to M. Lebrun, has originated at the Ophthalmic Institution at Brabant, and is described by the author in the appendix, under the name of "Extraction by a small median flap." It consists in the extraction of a cataract through a flap wound of a special form in the middle part of the superior segment of the cornea, and without the necessity of an iridectomy. The eye being fixed by means of forceps or a hook, the knife of Graefe is introduced in the cornea a millimetre or two beyond the external border of its transverse diameter, the edge of the knife turned upward and slightly in advance, in such a manner that the plane of the instrument forms with that of the iris an angle of about 30°. It enters and traverses the anterior chamber rapidly, in order to make the counter-opening at the corresponding point on the other side of the cornea. The incision after that is continued by a movement with the knife, so that its edge describes insensibly a curve, which terminates by the section of the cornea at the height of the juncture of its superior third part with its middle third part. There remains then nothing more than to make the opening of the capsule and to remove the cataract by the customary manœuvres. This incision is not in a plane. It is not parallel to the iris, as is the case in the other methods of extraction. It is a curved surface, which can be represented by the intersection of a cylinder (curved line, traced by the knife) with a section of a sphere (the cornea). The segment is from three to four millimetres in height, but becomes large on account of the curved line of its surface. The lateral parts are cut obliquely in the cornea, its summit alone is perpendicular, and is situated a little lower than the superior border of the pupil when moderately dilated. This section offers the following advantages:—

1. It is an easy method of extraction, and does not permit the escape of the crystalline until the proper moment.

2. Its situation in relation to the opening of the pupil permits the crystalline to be touched without obstacle, and without having, as in the extraction by large flaps, to push the iris before it, by which it is covered, and of which it is disembarrassed only by interfering more or less violently with the posterior face of the border of the pupil.

3. The opening made in the cornea adapts itself readily to the curved surfaces of the crystalline, causing the minimum amount of distension.

4. The edges of the wound fall together naturally, and the displacement of the flap is impossible.

5. The iris, except by accident, has no tendency to prolapse. It presents itself under the knife during the incision only if the latter be ill-directed, if it receives too soon the movement in advance which terminates the section; the premature escape of the aqueous humour is often the cause of this accident, which, however, has only relative importance. One still proceeds, and if it happens, as is usually the case, that the iris is cut and is engaged in the wound, an iridectomy is performed. In the ordinary details of this operation the integrity of the iris must be entirely respected.

6. The healing is generally very rapid, and leaves no other traces than a simple curved linear scar, which after some months has nearly ceased to be visible, and is, moreover, situated outside the field of the pupil.

This operation, practised during several years at the Ophthalmic Institution at Brussels, is described in the Volume XIII., 1st part, "Du Dictionnaire encyclopédique des sciences médicales" (Art. "Cataracte," by M. Warlomont). Paris, G. Masson, 1872. The author has made it the object of an article, which I have the honour to lay before you, with the prayer that you may give it a place in the Appendix of your Report.

Mr. Critchett said: I have practised the operation on several occasions, and I feel it to be a great addition to our resources. It is very unphilosophical that we should be confined to any one proceeding for removing cataract. I have no doubt that the time may and will come when we shall take each case carefully, and allow its circumstances materially to modify and regulate the operation we select. This operation is the very reverse of Von Graefe's. We may assume Graefe's to be partly peripheral, and to occupy the border line between cornea and sclerotic. Those who operate in that way frequently find that there does belong to it a certain amount of risk which belongs to no other. In many respects it is excellent. For a large majority of old people it gives us little or no trouble; it rapidly heals, and there is no possibility of prolapse. The danger of Graefe's operation is the risk that at the end of a week or a fortnight a most troublesome and destructive form of iritis may occur; sometimes a choroido-iritis, in which the eye becomes soft, and perishes. But more serious than that is the occurrence of sympathetic inflammation of the other eye, a thing which does occur now and then, although it is so unpleasant that one hardly likes to speak of it, and I notice

that oculists very seldom allude to it. It appears to me that in every case in which we are going to operate on both eyes we should always divide the risk by performing the operation of Graefe on one eye, and the operation just described by M. Warlomont on the other, the former operation being more likely to produce iritis, and the latter suppuration of the eyeball. In that way we may double the chance of success. It has occurred to me on two occasions to lose an eye by the two opposite ways. One in which I had performed M. Warlomont's operation I lost by suppuration; the other by secondary iritis. Therefore, when we have operated on one eye with bad result, always choose the other operation for the opposite eye. The great advantages of the operation M. Warlomont has suggested are—first, its absolute painlessness. It is the least painful operation that can be performed on the eye for extraction. It can almost invariably be performed without chloroform. The cataract escapes with ease, and there is less rough violence done to the eye than in any operation. The line of incision is scarcely visible afterwards, the pupil is perfect, and the optical results are as good as can be desired. The chief risk is the possibility of purulent infiltration. Prolapse of the iris is almost impossible. In both this operation and in the operation of Graefe it seems to me that the one principle is this—instead of making the flap a segment of a small circle we make it a segment of a large circle, of a circle about double the size of the cornea. That is the case in the operations of Graefe and of M. Warlomont, only in that of M. Warlomont the section is made lower down on the cornea. They seem to me to do away altogether with the plan of making the curve of the section correspond with the curve of the edge of the cornea. That involves, it seems to me, an unnecessary danger. Whether that larger section should be made in the sclerotic and border of the cornea is still *sub judice*. It seems to me that we may select a particular position for a particular case with very great advantage.

M. Hansen: I do not think we can speak of this without speaking at the same time of Liebreich's operation, which is to a great extent the same thing as that which has been proposed. The only difference is that Liebreich's is performed downwards and this is performed upwards. Liebreich's operation appears to be a little more linear than this, but the resemblance between them will be obvious to any one who has read Liebreich's book

or seen him operate. I have performed thirty or forty cases by Liebreich's method. All have regained their sight, but in some there have been considerable difficulty subsequently from adhesions of the iris and prolapse.

M. Hansen then read the following paper on the results of his operations :—

Observations on Liebreich's Operation for Cataract.

By Dr. Edmund Hansen, *of Copenhagen.*

After Dr. Warlomont had given a description of Lebrun's method of extraction I remarked that I could not understand how this (Lebrun's) method could be mentioned without referring to the method of Liebreich, inasmuch as the difference is quite immaterial. I have followed the method of Liebreich in 30 cases, and beg to say a few words concerning it. Though the small number of my operations do not permit me to arrive at definite conclusions, they have impressed me strongly with the value of the operation. I have performed 700 operations after Graefe's method, in strict harmony with the precepts of the originator; and I perfectly agree with Liebreich, that the peripheric situation of the cut carries in its train material disadvantages.

The objections advanced by Liebreich are (1) hæmorrhage, and (2) a disposition to prolapse of the vitreous. I would venture to add, (3) difficulty of making a precise excision of the iris; (4) difficulty in the division of the capsule; (5) objectionable vicinity to the corpus ciliare.

I do not regard it a matter of indifference, in regard to the propagation of the inflammation to the corpus ciliare, whether the cut is $\frac{1}{2}'''$, $1'''$, or 3, 4, $5'''$ distance from it. In the 700 cases of the operations performed according to V. Graefe's plan I have met with sympathetic ophthalmia in six, and this where the operation had been well executed. I know of no statistics concerning the appearance of ophthalmia in other forms of operation of cataract; but I do not doubt that other operators, if they will be only thoroughly candid, must have noticed the same. (6) The mechanism of removal of the lens is not favourable in V. Graefe's operation. After the discharge of the aqueous the lens adheres firmly to the posterior surface of the cornea, and during its escape it glides, under hard pressure, along this wall.

Almost every one must have noticed that frequently, at the first evening visit, the whole part of the cornea corresponding to the natural and artificial pupil appears of a dark grey colour, so that it is impossible to observe the condition of the pupil. Although this condition, which before we are familiar with it causes serious apprehension, slowly disappears, it reveals, nevertheless, that this part of the cornea has suffered

considerable contusion. Now, since the lens does not perform any rotation on its horizontal axis, no further enlargement of the opening in the capsule occurs during its escape, whilst an insufficient opening, made by means of the cystitome, immediately contracts. Again, when the incision is peripheric the subsequent extraction of the remains of the lens at the opposite side is rendered difficult. I believe, however, that the chief merit of Liebreich consists in the fact that he had the courage to omit the iridectomy. It requires courage because it is difficult to acknowledge that the numerous arguments advanced in order to prove the excellency, or rather the necessity, of the iridectomy are of no value when opposed by the results of actual practice. Yet I believe this is indeed the case. Certainly no operation has been so much abused as iridectomy, not only in cases of cataract, but in general diseases. In how many cases of mistaken diagnosis—in how many in which there were no indications for its performance—has it not been employed? Even in those cases in which its great discoverer, if I may say so, considered it indicated, and where its application has been generally adopted, experience has taught us that it does not quite fulfil all our expectations. I am of opinion that we may best show our respect for the memory of Graefe by following him in the path of sincere and independent observation, even if we should arrive at the conclusion that he has been sometimes mistaken.

I would here call attention to the fact that the relative value of iridectomy and non-iridectomy, in cases of cataract, could not be sufficiently examined before the form of the cut had reached its present perfection. Flap-extraction has been tried both with and without iridectomy. The difference in the result has been so small and uncertain that no conclusion could be arrived at. Linear extraction with iridectomy has also been performed. It still remains to perform linear extraction without iridectomy. I am of opinion that the advantages of iridectomy will be found much smaller than has been supposed. In order to do justice to iridectomy, I beg to observe that the ordinary practice of executing this operation coincidently with the extraction is altogether inadequate to prove that it possesses any real advantage. Firstly, there must be some engagement of the iris, and thus an unfavourable condition is introduced into the healing process; secondly, and this is of more importance, a fresh wound, corresponding in size to the margin of the coloboma, constitutes a not unimportant enlargement of the entire extent of the wound—not to mention the contusion of the new iris wound-borders during the escape of the lens. This contusion of the borders of the fresh wound of the iris is at least of as great importance as is the contusion of the uninjured iris in extraction without iri-

a few days it usually disappears. In Liebreich's operation there is a turning of the lens on its axis, and it presents itself at the wound without being pressed against the cornea as it is in the other. We are all agreed as to the dangers of the peripheric operation, but we are not all agreed as to the necessity of the iridectomy. I think we ought to be thankful to Liebreich because he has had the courage to leave it out.

Mr. Soelberg Wells: I think, sir, we should be very much obliged to M. Hansen for giving us some statistics as to the results of his operations. It is impossible to judge of a new operation by the statement that it has been very successful. I should have tried Liebreich's method had I found in his communication any even approximate estimate of results to guide me in the face of the obvious disadvantages of the occasional adhesion of the iris, and of the fact that any faulty approximation of the edges of the wound would cause unevenness of the cicatrix and more or less astigmatism as a result. These objections have far less weight in the case of M. Warlomont's upward operation than in the case of Liebreich's downward one. If any regular astigmatism remain it would be less disadvantageous upwards than downwards, and if the cicatrix did not wholly clear the opacity would be of less consequence upwards than downwards. The question of iridectomy in Graefe's operation would I think lead us too far if we were to attempt to discuss it now.

Mr. Jabez Hogg thanked M. Hansen for the statistics, but thought the almost certain prolapse of the iris a great objection to Liebreich's operation.

M. Chirálť: I desire to make some observations àpropos of the extraction of cataract by the method of M. Liebreich and of that by the method of Dr. Lebrun. In these operations there is a great difficulty in effecting the delivery of the lens and a great probability of the iris becoming engaged in the wound. I tried this method in 1869, and made a communication upon the subject to the Medical Society of Barcelona, but I found that 10 per cent. of the cases were lost in consequence of the engagement of the iris, and I have therefore given up the operation and now make a flap of the upper third of the cornea, which heals easily and which never becomes everted.

At the conclusion of this paper M. Donders proposed that the meeting should extend its sitting for an hour (6 P.M.), and

then proceeded to call upon Mr. Dudgeon, who accordingly commenced reading the paper of which an abstract is here given. After reading a few lines the President observed:

I think I have heard or seen this before. Are you certain that what you are reading is new?

Mr. Dudgeon continued to read, but was again stopped by the President, who said:

I am sorry to interrupt you, but is not what you say contained in a brochure you sent to me? I think I remember the phraseology; the views expressed are certainly the same. Unless you have something new to communicate I cannot permit you to go on.

The speaker still continuing to read, the President interrupting said: Will you be so kind as to give us a short explanation of the remainder of your paper? This Mr. Dudgeon after some demur proceeded to do.

On the Mechanism of Visual Accommodation.

By R. E. Dudgeon, M.D.

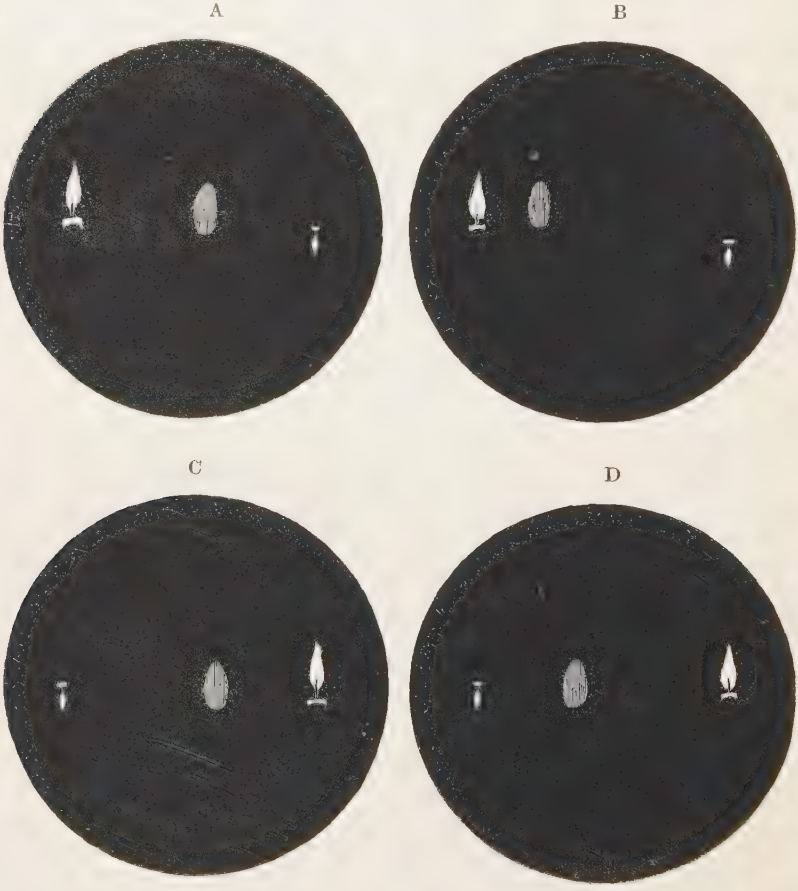
It is with much diffidence that I venture to dissent from the prevalent opinion, in regard to the mechanism of visual accommodation, supported as it is by the authority of the great physicist Helmholtz, and accepted as it has been by almost all recent writers on ophthalmology.

My observations and experiments have been limited by my opportunities, and these have not been as frequent as I could have wished; but I think they have been sufficient to show that the prevailing view as to the changes occurring during accommodation, is not altogether reconcilable with all observable facts, and to enable me to offer another explanation which I think is more in conformity with these facts, I constructed an instrument for observing the reflected images of the candle-flame, similar to that described by Cramer, but so arranged that I could transpose light and microscope, and use the latter at various angles.

Placing the light on the temporal side of the right eye, and looking at it from the nasal side, whilst the observed eye looking straight in front was directed to a distinct object, the appearance represented in the diagram (A) was observed, and when the sight was suddenly referred to an object on the same line, at 10 inches distance, the middle dim image reflected from the anterior surface of the crystalline moved through

an appreciable space, towards the large corneal image (B), just as described by Cramer and depicted by Donders. Of course I saw them inverted through the microscope, but I have drawn them in their actual position.

I now transposed candle and microscope, and observed the same eye from the temporal side, while the candle flame impinged on it from the nasal side.



The observed eye looking at a distant object, the three images were seen as in C. I now caused the observed eye to look at the near object. If the change produced in the dioptrical apparatus of the eye were an increase of the convexity of the anterior surface of the crystalline, and if the motion towards the corneal image in the first case were indica-

tive of that increase of convexity, the image reflected from that surface should have again moved towards the corneal image. But instead of doing so, it moved away from the corneal image and approached the image reflected from the posterior surface of the crystalline, as shown in D.

The only explanation of this seemed to me to be that the whole surface of the crystalline moved slightly in one direction—that in fact the crystalline lens executed a slight movement of rotation on its vertical axis from without inwards. If that was so, then the small posterior image should move also; and most probably it does move. Only as the curvatures of the anterior and posterior surfaces of the crystalline differ so greatly, it is quite possible that a movement of the image reflected by the comparatively flat anterior surface may be appreciable, while that reflected by the very convex posterior surface may be quite imperceptible.

In order to see whether a movement, such as I have described, would have the desired effect of shortening the focus, I tried it with an ordinary camera lens, and found that when the picture of a distant object was correctly perceived on the screen, and then thrown out of focus by the object being brought nearer, a slight turn of the lens on its axis would restore the pupil image of the near object, provided a diaphragm were placed before the lens to arrest aberrant rays, which would otherwise produce a blurred image of the object.

The eye has in the iris a diaphragm prominently placed in front of the crystalline, the opening of which diminishes when the eye is adjusted to near vision, so that any aberrant rays which might mar the proportions of the image would be cut off. But as the curvatures of the lenticular apparatus of the eye are not spherical but ellipsoidal, and as Descartes long ago showed that such a form of lens obviated the aberration which occurred in lenses with spherical curves, it will be seen that the lenses of the eye require this diaphragm even less than ordinary lenses with spherical curves. In young people we often find very dilated pupils in both distant and near vision co-existing with excellent sight at all distances. In them, no doubt, the normal ellipsoidal shape of the curvatures of the lenses must exist in perfection. Probably contraction of the pupil in many cases serves rather to correct defects in the shape of the crystalline lens than to exclude too bright a light. It contracts to exclude rays of light, not because they are too many, but because they would disturb the proportions of the image on the retina.

From observations I have made on short-sighted eyes, I am of opinion that myopia may often be due to an abnormal convexity of the anterior surface of the crystalline. At all events, I have noticed that the image of the candle flame on the anterior surface of the crystalline is in some

myopes brighter and smaller than it is in more perfect eyes, and though it moves distinctly in the attempt to adjust the eye from distant to near vision, the movements are irregular, I would almost say puckering.

In presbyopic eyes, on the contrary, the image from the anterior surface of the crystalline appeared to me to be larger and dimmer than in normal eyes. Hence I infer that the anterior surface of the crystalline tends to become flatter in advanced life, and perhaps it loses somewhat of its ellipsoidal shape, which necessitates a smaller pupil for distinct vision.

Probably those recorded cases where the power of adjusting the eyes to different distances remained after the crystalline was extracted, were instances of abnormal contractility of the iris, whereby an unusually small pupil was produced, or the lids were closed sufficiently to exclude all but perpendicularly impinging rays.

The difficulties in the way of accepting the prevalent view of the changes occurring in accommodation from distant to near vision are chiefly these:

1. The impossibility of reconciling the movements of the image reflected from the anterior surface of the crystalline, observed during accommodation from distant to near objects, with an increase of the convexity of that surface.

2. The fact that the size of the said image is hardly, if at all, altered during accommodation. Whereas had the convexity altered, as alleged, from a radius of curvature of ten millimetres to one of six millimetres, the size of the image would be very perceptibly lessened and its brightness very much increased, which as far as I have been able to observe is not the case. I think I have seen cases where the brightness of the dim image increased as it approached the pupillary margin (see the diagram given by Donders); but this would be accounted for by the peculiar shape of the anterior surface of the crystalline, it being flattest in the centre, and increasing in convexity towards the circumference.

3. The fact that were the convexity of the crystalline and its thickness increased to the extent alleged, its equatorial dimensions would be proportionately diminished, but nothing of the sort has yet been observed even in cases like that described by Graefe, where the whole of the iris was removed while accommodation remained intact; nor in cases where artificial pupil has been performed by tearing the iris away from its sclerotic attachment.

4. The apparent inadequacy of the muscular arrangement of the ciliary ligament or muscle to produce an increase of the convexity of the crystalline. Descartes and Young supposed the crystalline to be itself a muscular organ by its contraction causing the presumed increase of convexity, and Sir John Herschel* thought this was feasible, though I

* *Encycl. Metrop.*, art. "Light."

believe none now entertain that opinion. Hensen and Voelcker,* believing that the crystalline increased in size during near accommodation, suggest that it is composed of a series of delicate tubes, that are filled with water by the contraction of the ciliary muscle, and emptied when that muscle is again relaxed. I am not aware that any physiologists share this opinion, to which there are obvious objections.

The view I have put forward seems to be more in accordance with the facts observed.

1. It is consistent with the movements of the image reflected by the anterior surface of the crystalline when looked at from both sides of the eye.

2. It is consonant with the unaltered or almost unaltered size of that image.

3. It would not involve any diminution of the equator of the crystalline.

4. It seems more within the power of the arrangement of the fibres of the ciliary muscle. In spite of what Langenbeck and H. Müller state, there is no general belief that those fibres, or any of them, are orbicular in their arrangement; and if not, it would be difficult to understand how they could produce increased convexity of the crystalline by any other arrangement. What is known of their arrangement would seem to be adapted to produce the tilting movement I have described, provided they did not all act together; and as they derive their motor from a branch of the third pair of nerves, which also supplies five variously, separately, and often oppositely acting muscles of the eye and lid, it is not, I think, unfeasible to suppose that the various fasciculi of the ciliary muscle may act in different or even opposite directions.

5. The sudden return of the lens to its position of rest may account for the *phosphenes* or flashes of bright irides described by Czermack† as occurring when this takes place in the dark.

In conclusion, I may mention that I have endeavoured to verify all that I have observed in the eye itself by experiments outside the eye. I have even constructed a larger model of the eye on a scale ten times the size of nature, in order to put the accuracy of my observations to the proof. The measurement for this model eye I took from the best sources, reducing them all to millimetres, and reproducing them in the model in centimetres. I could not, of course, imitate the ellipsoidal curvatures of the eye lenses, but I employed spherical curvatures as near the mark as possible, and I found them to answer beyond expectation.

The globe of the eye is represented by a glass globe twenty-four centimetres in diameter, with a section cut out in front for the reception

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* *Experimental Untersuchung über den Mechanismus der Accommodation.* Kiel. 1868.

† *Arch. f. Ophth.*, Bd. vii.

of a section of a globe of eight centimetres radius of curvature to represent the cornea. This of course is left clear, but the globe is painted black inside and white outside, a circular clear space being left in the axis of vision to observe the picture formed on the retina. A diaphragm of vulcanized india-rubber is suspended three centimetres behind the cornea to represent the iris, perforated with a hole to imitate the pupil moderately dilated. The crystalline is made with two segments of globes, respectively ten and six centimetres radius of curvature, five centimetres thick in the centre, and filled with glycerine, which I found to be a substance whose refractive power corresponded tolerably well to that of the crystalline. The aqueous and vitreous humours are represented by water, with which the globe is filled. In this model I found that an object at four and a half feet distance is accurately focussed at the back of the globe, and that when the object is brought to within three feet of the eye, and thereby the focus is thrown behind the globe, an accurate picture of the near object is restored by turning the crystalline slightly on its vertical axis. The reflected images of the candle placed at one side and viewed from the other appear as in the natural eye, and the movement of the image from the anterior surface of the crystalline when the rotation of the crystalline is effected, are precisely as I have sketched them in the natural eye.

It will be noticed that the distances of four and a half feet for distant objects and three feet for near objects are proportionally less than they are in the actual eye. This is owing to glycerine having an index of refraction somewhat greater than the real crystalline. With a mixture of glycerine and water in equal proportions I was able to reproduce more exactly the refractive power of the real crystalline, but I found the shorter distances required by pure glycerine more convenient for my purpose.

On the Ophthalmological Measurements of the Eyes of Children.

By M. Woinow, *of Moscow.*

I desire to make some observations on the ophthalmometric measurements of the eyes of children. I here present a table, in which will be found the data of the dioptric constants of the eyes of children. I have selected three examples, and in the table these three will be found in opposition to one another, or perhaps, more properly speaking, associated for comparison. An examination of the data will show that the dioptric constants of the child do not materially differ from those

		r	Depth.	R′	R″	Thickness.	Distance of the posterior surface.	f′	f″	S	h′
N.E. æt. 9 Emmetropia.	R	7.63	2.31	7.8	6.01	3.68	5.99	22.6745	30.2857	40.6239	1.95661
	A	...	1.994	5.08	5.05	4.28	6.274	...	...	31.9578	2.04511
M.S. æt. 7. Hypermetropia $\frac{1}{24}$	R	7.43	2.463	8.89	6.05	3.356	5 819	22.0802	29.4919	43.1238	1.87
	A	...	1.734	5.01	5.28	4.085	...	...	...	31.2222	1.89082
A.F. æt. 6. Hypermetropia $\frac{1}{48}$	R	7.28	2.51	8.04	5.65	3.42	5.93	21.6344	28.8965	39.8272	1.8871
	A	...	2.01	5.03	5.03	3.99	6.00	...	...	30.5451	1.89615

R—Rest.—Rühe.

A—Accommodation.—Accommodation.

r—Radius of the cornea.—Hornhautradius.

Depth.—Depth of the anterior chamber.—Tiefe der Vordererkämmer H′H.

$\left.\begin{matrix} R' \\ R'' \end{matrix}\right\}$ Radii of the lens.—Linsen-radien.

Thickness.—Thickness of the crystalline lens.—Dicke der Crystallinse.

$\left.\begin{matrix} f' \\ f'' \end{matrix}\right\}$ Focal length of the cornea.—Brennweite d. Hornhaut.

S—Focal length of the lens.—Brennweite d. Linse.

$\left.\begin{matrix} h' \\ h'' \end{matrix}\right\}$ Principal points of the lens.—Hauptpunkte d. Linse.

h″	h′h″	F′	F″	H′	H″	H′H″	K′	K″	$\frac{1}{a}$	Axis.
0759	0.2158	13.7825	18.4089	1.44733	1.88936	0.44203	6.07373	6.51576	...	20.29826
8304	0.1	11.6978	15.9883	1.60432	2.05904	0.45472	5.89482	6.34957	$\frac{1}{25}$	...
.2929	0.19155	13.9453	18.7987	1.40197	1.904	0.50203	6.2544	6.7564	...	20 7
.99396	0.10022	12.0757	16.1292	1.40203	1.84252	0.44049	5.4455	5.896	$\frac{1}{5\,1\,5}$	...
.3261	0.2068	13.3947	17.891	1.17468	1.8815	0.70682	5.67098	6.3778	...	19.7725
89615	0.1977	11.900	15.8945	1.52328	1.95316	0.36371	5.58395	5.94766	$\frac{1}{3\,0\,5}$	...

h′h″—Distance between the principal points of the lens.—Abstand zwischen d. Linsenhauptpunkte.

$\left.\begin{matrix} F' \\ F'' \end{matrix}\right\}$ Focal length of the eyes.—Brennweiten des Auges.

$\left.\begin{matrix} H^1 \\ H^2 \end{matrix}\right\}$ Chief points.—Hauptpunkte.

$\left.\begin{matrix} K^1 \\ K^2 \end{matrix}\right\}$ Nodal points.—Knotenpunkte.

K^1K^2—Distance between the chief points between the eyes.—Abstand zwischen d. Hauptpunkten des Auges.

$\frac{1}{a}$—Extent of accommodation.—Accommodations-weite.

Axis—Length of the axis of the eye.—Die Länge des Augenaxe.

of the adult. The principal difference lies in the circumstance that here (*i.e.*, in children) the distances of the refracting surfaces from each other are smaller than in adults, whilst the curvature of the refracting surfaces and the exponent of refraction are identical. In the act of accommodation the eye of the child undergoes the same changes as that of the adult. It may be seen, however, that during accommodation the posterior surface of the lens moves backwards.

An Account of a Remarkable Case of Cysticercus Cellulosæ within the Retina.

By Dr. L. Carreras y Arago, *of Barcelona.*

Up to the present time, Cysticerci within the human eye have not been observed in my country, Spain; and the case which I wish to communicate is interesting, both because I have been able to observe it from its first appearance in the retina, and because it explains, from my point of view, its origin, and the manner in which it made its appearance within the eye.

The patient, Andre Saladrigos, a native of Barcelona, aged thirty-eight, of lymphatic temperament and robust health, a coachman, had suffered in infancy from a plastic iritis in the left eye, which left several adhesions—posterior synechiæ—but did not materially impair his sight. The right eye, when sound in every way six weeks previously, had received a violent blow over the upper lid with a fir pole. At the moment the patient felt severe pain, but though this was not followed by any inflammation of the eye, at the end of ten days he found his vision was impaired with the appearance of a mist before the sight; and, as he got worse from day to day, he came to me for advice.

A minute examination of the right eye showed the conjunctiva, the cornea, and the sclerotic to be quite normal, the pupil slightly dilated and rather inactive, the lens and vitreous humour perfectly transparent, so that I could examine the retina with the ophthalmoscope. This I found covered with white exudations, which in places interrupted the continuity of its blood-vessels, and at the lower part there appeared a serous pouch surrounded by engorged blood-vessels, completely analogous to the serous bulging which attends detachment of the retina; neither the optic papilla nor any central vessels were to be seen.

The patient complained of no pain, but merely experienced a sense of weight in the eye, some supra-orbital pain, with occasional flashes of light. The acuteness of vision and the visual field were so diminished

that he could only count fingers with difficulty, and could not distinguish any of Snellen's test types; for, to use the patient's own words, a dense black fog covered everything he looked at.

On examination of the above-mentioned symptoms, the disease was diagnosed as exudative retinitis with detached retina. The prognosis was reserved, and the patient was ordered perchloride of mercury internally, and mercurial frictions over the eyebrow. At the end of eight days there was some improvement, so that he could read Snellen's No. 100. I did not examine him with the ophthalmoscope, but I advised him to pursue the same treatment, and to come and see me in a week's time. At the end of six days he came to me again, much alarmed, because the improvement had disappeared, and because the flashes of light troubled him so much, that he compared them to the artificial colours of fireworks.

When I again examined him with the ophthalmoscope, having previously dilated the pupil with atropine, I found the media transparent, without any exudation in the vitreous humour; the upper part of the fundus and some small portion of its inner part retained the normal rose colour; but the central, the external, and inferior portions were covered with white patches of exudation, which, like films, obscured the retinal vessels, giving rise to an appearance of folds or ridges in places which looked white and flexible upon which the vessels were apparent, curved and bent, altogether presenting the appearance of serous elevations, with this difference only, that one saw a kind of confluence of these serous swellings, surrounding a small portion of nearly normal retina, from which small branches of the central artery could be seen to pass out. But what astonished me greatly was to see a few lines lower down, and to the outer side of this point, a globe-shaped body well defined, of a bluish-white colour, to which was attached a neck, indented and irregular, rather longer than it was broad, narrowing into a more slender portion which terminated by a minute head, which was marked by two small eminences and a slight central prolongation, forming as a whole a kind of trunk, which was of a bluish-white colour and very moveable. Now I felt sure that I had to deal with a cysticercus cellulosæ, which occupied the middle and lower portions of the retina, slightly in front and inclined forwards, so as to compress the vitreous humour without as yet having caused any rupture of the hyaloid membrane.

This diagnosis was borne out by the probability that the serous retinitis and the detachment of the retina were entirely due to the cysticercus, and, consequently, it was useless to persevere with the treatment pursued up to this time. Convinced of the inadequacy of general means in combating the entozoon from this time, I limited my plans of treat-

ment to watching for an opportunity to extract it, whenever it should give me a favourable chance of so doing; for, owing to there being some posterior synechiæ in the pupil of the left eye, I was afraid of provoking an inflammation of the right eye, which might embarrass me; and in case pain should occur, I should have preferred to remove the eye rather than to set up an ophthalmitis, which might be the forerunner of sympathetic ophthalmia.

I saw the patient on several occasions, and was able to ratify my diagnosis, having had the honour of presenting him to the Academy of Medicine at Barcelona, where my illustrious colleagues and the distinguished observers, Drs. Osio and Caratt, who have examined him, were highly interested with the various shapes the cysticercus assumed, at one moment by becoming globe-shaped by retraction of its narrow neck, at another moment by elongations of both its body and its neck. It was remarkable, too, what a difference there was between the whitish semi-transparent blue colour of the neck itself and the glistening milk-white colour of the rest of the entozoon.

After some months the cysticercus had considerably increased in size without causing the patient any pain, and the retinal exudations covered it so completely that one could hardly perceive its movements. At the present moment, at the end of eight months, it appears completely encysted, having the appearance of a spherical mass, formed by the vesicle and the exudations which surround it; but the latter are so thick that it is very difficult to distinguish the vesicle itself from the neck. As the patient was in no pain, and as there was no hope of his saving any vision, I made use of some anthelmintics—amongst others, phenic acid—and I resolved try no further surgical treatment until a more favourable opportunity for removing the entozoon should present itself.

The cysticercus cellulosæ is more or less common in different countries. Thus, in Germany, for example, Graefe has found it in eighty cases, from amongst eighty thousand patients; while in Spain, amongst thirteen thousand patients, whose names are upon the registers of our practice, we have only found one single instance, and we do not know, strictly speaking, whether any other professor has, up to this time, ever met with a case. For the entozoa which Morillas has described in his Monograph, published at Havannah, in 1870, without doubt may be referred to Filiaria medinensis; and Chirált of Seville, though he believes that he has seen one such case, was unable to make a second examination, so that he was not quite certain of his diagnosis.

Ever since 1784, when Goeze first observed a cysticercus in a measly pig, and two years later, when Werner observed it for the first time in man, we have been able to study the creature in human beings. The

foreign bodies found by Portal, between the choroid and the retina, described in his work on Medical Anatomy, in 1803, we may fairly suspect to have belonged to this class. We may record, too, that Schott and Soemmering were the first to observe it, in 1830, in the anterior chamber, each in a case which was possibly the same; and since that time it has been observed in all the membranes and humours of the eye. Baum and Hoering, in 1838, in the conjunctiva; Appia and Cuvier, in 1841, in the epithelium of the cornea; Sichel, in 1843, beneath the rim of the eyelids; and since the discovery of the ophthalmoscope by Helmholtz, Graefe was able to examine them perfectly in the fundus of the eye, and within the vitreous humour; in 1856, Desmarres found it in the retina; in 1863, Graefe found it in the orbit, and in 1864, in the crystalline lens.

Since the publication of the works of the great naturalists Siebold, Küchenmeister, Van Beneden, Leuckart, &c., there is no doubt that an entozoon cannot present itself without the previous existence of a germ of identical nature, capable of undergoing various changes in the process of development, which have led to its being described as several different animals; and herein have arisen all the confused ideas concerning the mode of origin of the cysticercus cellulosæ. With a view of throwing light upon this generation, I propose to examine the different evolutions of the entozoon, by drawing attention to its four different stages of development—the egg, the hydatid, the worm, and the segment of the tape-worm—and we shall then see clearly the connexion which exists between the one and the other, and its mode of development according to the kind of tissue in which it makes its abode.

The egg or larva of a tænia contains an embryo which is short, without joints, and provided from its birth with three pairs of hooks in order to fix itself to the tissues of its choice, and when once established in the substance of any tissue is capable of giving origin to a second individual, shut up in its own sac, in the same manner that a silk-worm shuts itself in its cocoon in order to change into a chrysalis, to use a happy comparison of Van Beneden.

When thus formed, the new individual passes from the egg to become the cysticercus, whose characters are so well known that it is not easy to confound it with any other animal; for instance, the delicate, fragile, and semi-transparent vesicle filled with fluid, in order to facilitate the movements of the animal, whose body is long and slender, with a narrow and delicate neck, which terminates in a head with four suckers and a double row of hooklets. The cysticercus can produce other animals like itself; but in order to complete its development, and to change into a tænia, it is necessary that it should pass into the alimentary canal, and that it should attach itself to the mucous walls by means of its hooks. In this condition it loses its vesicle, becomes transparent, and acquires many segments or articulations, one after the other, which are complete organisms, provided with elements indispensable to their individuality. It then lengthens like a riband, and enters its third stage of development, that of tænia. When the period of generation arrives, the ovaries contained in the segments of the tænia become filled with small eggs; and as these swell and grow, the segments become separated, each one becoming a special and complete structure. These, carried away by fæcal matter, live for some days in their entirety, and then, becoming broken up, disseminate the minute eggs which they contain. These eggs possess this peculiarity, that they retain for a long time their germinative power, resisting for a long time the action of alcohol, as well as the extreme degrees of heat and cold, of dryness and of moisture; and then, when taken into the body again with food, they undergo the transformations mentioned above. No wonder, then, at their remarkable propagation.

Cysticerci are generally found in the cellular tissue of the pig, and also that of other animals, as the ox, mice, the cat, &c.; and from the resemblance which Siebold found to exist between the head of the *Cysticercus fascicolaris* of the mouse and the head of the *Tænia crassicollis* from which cats suffered, he divined the relation existing between the two animals. In order to admit this hypothesis, it was necessary to prove it by different experiments. When the minute eggs, with their membranous coverings, or, better still, the cysticerci themselves, were given as food, it was seen that the former became cysticerci, and the latter, by lengthening themselves like ribands, became transformed into tænia. Later on experi-

ments, made by Küchenmeister (of Zittau), in 1835, upon a woman condemned to death, have confirmed this doctrine; for it has been shown that cysticerci introduced into the alimentary canal of man become adherent to the walls of the intestine with their suckers, detach themselves from their vesicles, and then acquire new canals, and become converted into tænia. The experiments of Leuckart proved the same thing in the case of a man, aged thirty, who voluntarily undertook to swallow a certain number of cysticerci procured from measly pork, and who, at the end of two months, suffered from tænia; as also those of Humbert, of Geneva, who, in 1854, repeated the experiment upon himself, and after having swallowed fourteen cysticerci, three months afterwards suffered from tænia.

When we consider all the transformations which tæniæ undergo, it is easy to understand, without being forced to fall back upon the theory of spontaneous development, the mode in which a cysticercus might present itself in the retina of the man who is the object of our present memoir. It is, indeed, difficult to explain how an egg of a tænia can be absorbed by the lymphatics and carried into the current of the circulation; but when Delle Chiaga demonstrated the existence of Polystoma in the blood, there could be no doubt of the possibility of entozoa being present also, and these latter must penetrate by being carried in by the lymphatics or by traversing the walls of the vessels. Although we can understand the route which an hydatid may take in passing from the intestine to the liver without penetrating the vessels, yet we cannot conceive any other route except the current of the circulation by which the egg of a tapeworm can make its way from the intestine into the tissue of the retina, and we believe that, carried by the blood, it produces in the capillaries a kind of embolism, and then, by undergoing change, it dilates the vessel, makes its way through its walls, and, by continued development, transforms itself into a cysticercus. There is no doubt, then, that cysticercus in man proceeds from the egg of a tænia, and the coincidence that Graefe has, on several occasions, seen cysticercus within the eye and tænia to exist in the same individual, and has seen cysticercus in those living with others who were suffering from tænia, proves the connexion between the two entozoa.

It has been observed, too, that in countries where much fresh pork is eaten, especially in the summer, this kind of parasite is that most frequently met with in man; and, to bear out this observation, my patient was passionately fond of this kind of meat, and often ate it even raw in summer, a very rare thing in our country, where it is forbidden to kill pigs during the warm season—a very wise rule of Government, and one which probably explains the rarity of cysticerci in our country as compared with many others, and which, if imitated by the rest of Europe, would perhaps help to decrease the propagation of this terrible entozoon.

M. Donders: I have not seen a single case in Holland.

M. Warlomont: Nor have I seen any in Belgium.

A Member: There have only been two in France.

M. Donders: Tænia may be introduced, not with the pork alone, but with the salad eaten with it; in the latter case derived from the excrement of animals discharged near or upon the vegetables.

M. Secondi: In Italy neither my colleague, M. Quaglino, nor myself have met with a single case of cysticercus in the eye, but I have cases which justify me in believing that tæniæ not unfrequently occur in the intestines, in Italy, where salad and salted pork are freely eaten.

M. Donders: That is very interesting. Sometimes they are found in the oil taken with the salad.

Aneurism of the Central Artery of the Retina.

By M. Galezowski.

I desire to bring before the meeting two cases, one in which there was an aneurism of the central artery of the retina, and another in which there was an aneurism of the orbit. In the former case I observed a vascular roundish tumour, situated at the inner border of the optic papilla of the left eye, in a young woman, aged twenty-four, who had for some months suffered from impaired vision in this eye. Her vision had previously been excellent, she had never received any injury, her general health had been good, and there was no cardiac disease. In April, 1872, she was sent to me by Dr. Maurice Raymond (of Paris), as she complained of some defect in her left eye. I found that her vision was so far impaired that she could only read No. 7 of Giraud-Teulon's test types; the field of vision was of normal extent, she could distinguish colours perfectly, but at times experienced an obscuration of the vision. On ophthalmoscopic examination I observed a well-defined red spot, occupying the inner half of the papilla. In the first instance I imagined it to be an apoplexy, and treated the patient accordingly, but I was astonished to find the same spot unaltered in appearance at the end of a month. I then noticed that the spot projected to some extent into the vitreous, and at once began to examine it more attentively, and having dilated

the pupil, I made, whilst using the ophthalmoscope, light pressure on the globe of the eye with the finger. The tumour then presented well marked pulsations. Each pulsation was observed simultaneously in the central artery over the whole extent of the papilla, and it became evident to me that it was a case of true aneurism of the central artery of the retina. MM. Charcot, Raymond, and Daguinet, who have since seen the patient, entertain the same opinion. The second case to which I wish to call the attention of the meeting is one of aneurism of the orbit, in which I have effected a cure by digital compression continued for four months—not indeed without interruption, but for periods of thirty or fifty minutes, or even for an hour at a time, every or every other day. The following is an outline of the case, which has already appeared *in extenso* in the *Gazette des Hôpitaux de Paris*. The patient, whilst young, feeble, and anæmic, at the end of December, 1870, heard a noise as of something cracking in the head, and immediately afterwards the sound as of a railway train, which continued to augment in violence. The patient came to consult me towards the end of February, 1871, and then presented a considerable protrusion of the globe of the left eye, ptosis of the upper eyelid, and an ectropion of the lower lid. The conjunctiva, which was much swollen, protruded between the lids. On raising the upper eyelid I found the eye injected, but the cornea and pupil natural; all the muscles of the eye were paralysed, vision was much impaired, and she could scarcely see the largest test types. On ophthalmoscopic examination I discovered that there was optic peri-neuritis; the patient complained of severe peri-orbital pain. On applying the stethoscope to the head I heard a bruit coincident with the pulsation in the exophthalmic eye. The bruit was audible throughout the whole head, and even in the right eye, though it was here feeble. It was an aneurism of the orbit, which had been hitherto considered as an aneurism of the ophthalmic artery, and was in my opinion due to rupture of the carotid in its passage through the cavernous sinus. I have shown this patient to MM. Richet, Gosselin, and Guéneau de Mussy, who have all corroborated the existence of an aneurism. Some years ago Professor Nélaton demonstrated that in a large number of cases of aneurism of the ophthalmic artery, it was not really the ophthalmic but the carotid artery during its passage through the cavernous sinus that was primarily affected, and that the arterial

blood entering the ophthalmic vein occasioned the exophthalmia. Two cases on which M. Nélaton made post-mortem examinations established the occurrence of this lesion. The cases in question will be found reported in the theses of two pupils of M. Nélaton. One by M. Henry, the other by M. Delins. I agree with M. Nélaton in thinking that in a large number of these cases the carotid is affected. I submitted the patient to the following treatment. I applied a compress bandage to the exophthalmic eye, and at the same time directed that digital compression should be made upon the carotid in the neck, for the space of half an hour or an hour every day. This was done either by myself or by one or other of the surgeons attending my clinique. This treatment has proved perfectly successful. The patient felt herself improved after each compression, the projection of the eye diminished, the bruit entirely disappeared during the compression, and returned only when the pressure was intermitted. In the month of July the bruit was scarcely audible, and in September she was cured. No relapse has since occurred. Vision has become almost normal, as she can read No. 3 of Giraud-Teulon's scale. There remains, however, a little infiltration around the papilla.

M. Wecker: The anomalies that M. Galczowski has brought before us have been described by M. Lans of Bordeaux, and M. Martin of Marseilles. The special case of which he has here given us an illustration seems to be "un lacet" (plexus?) simply, in which movement is produced by pulsations. As to the aneurism of the orbit, I showed four years ago that these enlargements resulted from disease of the veins, and that dilatation of the arteries does not occur in the orbit. I learn with much pleasure that the method of compression adopted by M. Galezowski has effected such a complete cure, because at the time M. Galczowski published this case in the *Gazette des Hôpitaux*, and spoke in favourable terms of compression, the cure was not perfect.

Friday, August 2.—Morning Sitting.

M. DONDERS IN THE CHAIR.

The Value of Intraocular Myotomy in Myopia.

By James Vose Solomon, F.R.C.S., *Surgeon to the Eye Hospital, and Professor of Ophthalmic Surgery in Queen's College, Birmingham.*

Since the year 1860 I have treated certain cases of myopia by intraocular myotomy, and have obtained very remarkable results, in some in respect to the accommodation, in others as regards distant vision; occasionally both these advantages have occurred to one patient.

Intraocular myotomy is performed by making an incision about two lines, or two lines and a half in length, parallel with the equator of the eyeball, through the corneo-scleral union, the pillars of the iris, and the ciliary muscle.

The best instrument for the purpose is a narrow Beer's cataract knife (Sichel's). Care should be taken that the wound in the ciliary muscle is of the same length as the external one, and that the knife is withdrawn *slowly*, so as to avoid the occurrence of *procidentia iridis* or the escape of vitreous humour.* The recumbent posture and complete anæsthesia present advantages which it is wise not to disregard.

The *after* treatment is very simple, consisting of absolute rest of the eyes and exclusion of bright light, the use of an abstemious diet, and mild saline aperients. The operated eye should be kept closed for five or seven days with strips of plaster, and cool with wet linen rags. I am prejudiced in favour of the application of a blister behind the ear immediately after the intraocular incision has been made.

The subjects selected for operation should be healthy, and free from all suspicion of being affected with a syphilitic or scrofulous taint.

The more perfect the health the more safe is the intraocular myotomy.

Eyes which present abnormally great transverse diameters, and those affected with extensive atrophic changes in addition to a staphyloma posticum, have not afforded such results as to encourage the application of intraocular myotomy for their relief.

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* Vide *Med. Times and Gazette*, vols. 1861–2.

In one or two exceptional instances which appeared favourable the result of the treatment has been of a negative kind; in other words, no change has been effected in the accommodation or refraction.

Case I. (from Notes by Mr. Bracey, House-surgeon).—Mary Hollis, æt. thirteen, admitted into the Eye Hospital, March 7th, for myopia of both eyes. Neither her father nor mother is near-sighted.

A small and deep staphyloma posticum is observed in both eyes. Snellen's types were used as tests:—

Right eye: V. = CC ... ... $3\frac{1}{2}'$
C ... ... 27″

Operation March 14th.

June 16th.—Right eye: V. = CC ... ... 9′
C ... ... $6\frac{1}{2}'$

Left eye: V. = CC ... ... $3\frac{1}{2}'$
C ... ... 22″

Operation April 4th.

June 16th.—Left eye: V. = CC ... ... 8′
C ... ... 6′

May 19th.—The mother of the child reports that the patient sweeps the floor of the house more perfectly than before operation, leaving no particles of dust as she used to do.

June 16th.—The mother states that the child can now tell a man from a woman at a hundred yards distance, which she formerly was unable to do; indeed, at the same distance she used to be incapable of seeing a carriage pass.

These people, I may be allowed to explain, lived in the country, and the public road was a hundred yards from their cottage. At my request the distance was "stepped" by the father of the child.

The effect of the treatment upon the accommodation was slight, and though given at the Congress has been here omitted.

Case II.—Hannah Lythall, æt. forty-four, was admitted into the Eye Hospital, January 24th. For the following notes I am indebted to my friend, Mr. Bracey, at the time our house-surgeon.

The patient has been myopic since she was twenty years of age, but much worse the last six months. She complains of muscæ volitantes, supraorbital pain, and photopsy in the dark, especially after being much fatigued. These symptoms are chiefly confined to the left eye. Temperament highly nervous.

T. normal: a narrow staphyloma posticum is seen in both eyes. Optic nerves well supplied with blood.

Left eye; Jäger's types were employed as tests :—

V. = No. 1	4″
8	$5\frac{1}{2}$″
20	2′

Operation February 7th.

June 15th.—V. = No. 1	$5\frac{1}{2}$″
8	$8\frac{1}{2}$′
20	3′

Right eye tested with Jäger's types :—

V. = No. 1	10″
20	5′

Operation February 17th.

June 15th.—V. = No. 1	14″
20	11′

Before operation the right eye with — 10 read 18 (J.) at ten feet, and on June 15 the same type at eighteen feet with — 14, indicating most conclusively that a considerable decrease had been effected by the treatment in the refraction of the eye.

Dr. Roosa, of New York: If Mr. Solomon recommends this operation for all cases of extreme myopia, I should like to ask whether the dangers that attach to extreme myopia—that is, detachment of the retina and increase of the sclero-choroiditis posterior—are not increased rather than diminished by division of the ciliary muscle. My experience leads me to believe that the correction of the myopia, as far as possible, by convex glasses would be better than the risk of an operation. Even with a very marked degree of myopia, patients can usually get on pretty well with glasses, and when it is combined with astigmatism, with cylindrical and myopic glasses combined patients may usually do their ordinary work of life.

Mr. Brudenell Carter: I think, Mr. President, that in many of these cases of extreme myopia, Dr. Dobrowolsky has lately shown us that there is apt to be considerable spasm of the muscle of accommodation, and that the myopia which depends on the refraction of the eye is increased. Dr. Dobrowolsky has shown us that by the use of atropine we can relax this spasm of accommodation and make a very material difference in the degree of myopia, nearly as much as could be obtained by division of the ciliary muscle, supposing it to be accomplished satisfactorily. In atropine we have a means of relief which is free from all the dangers of intraocular myotomy. Detachment of

the retina is certainly one of those dangers, and with that resource I think one is hardly justified in incising the eyeball of a patient who has no other ailment.

The President: I do not think that the figures before us prove that there was any diminution of the myopia. The only way to determine that is to ascertain the point at which a glass is necessary. The figures only show the relative difference in the furthest point of distinct vision, which is easily accounted for by a difference in the size of the pupil. What we want to know, is the glass which would enable the patient to read print at a great distance. Until we know that the myopia was really diminished we can hardly discuss the operation. These cases might be, as Mr. Carter said, cases of spasm, and therefore atropine should first be used, but I do not agree with Dr. Dobrowolsky that the cases of spasm are common. I have used atropine in a large number of cases, but have not found diminution of refraction in more than one or two out of every fifty cases. Those cases then are exceptional, but at all events we should, before performing such an operation, after applying atropine, always determine exactly what is the refraction of the eye, and repeat the observation after the operation.

Mr. Solomon, in reply to Dr. Roosa, said he did not advocate the operation to the exclusion of spectacles, but only for those cases in which spectacles were objectionable, as in the case of servants, among whom he had had many who after the operation were much more capable of earning their living than before. He agreed with the observations that had been made as to the use of atropine, but considered spasm rare and easily to be overcome by simple rest. The dangers of the operation, he repeated, were inappreciable if the eye were simply myopic and there were no posterior staphyloma and the patient's health good. Before he used the operation he had found prussic acid of great service as a drop, one part of (Scheele's) acid being mixed with two of distilled water.

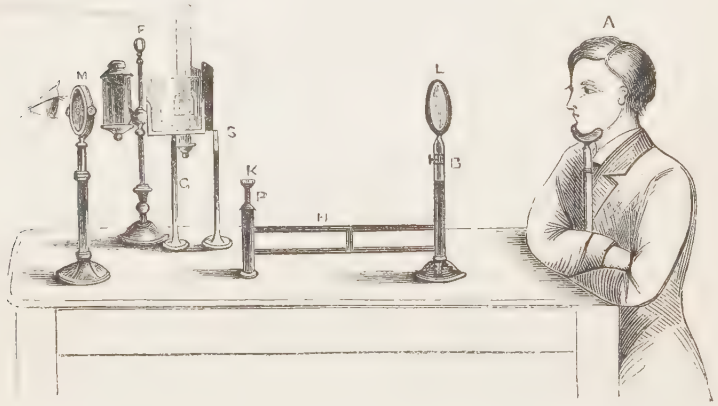
Description of an Improved Demonstrating Ophthalmoscope, and of a Perimeter.

By Robert Brudenell Carter, *Ophthalmic Surgeon to St. George's Hospital.*

Mr. Brudenell Carter showed an improved demonstrating ophthalmoscope. The apparatus requires the use of a table, which should be four feet long, and which need not be more than

eighteen inches wide; or it may be arranged across one end of an ordinary dining-table. The person whose eye is to be observed should be seated comfortably, as shown at A in fig. 1, with his chin supported by a chin-rest which can be fixed at any desired height, and which should render the plane of the face vertical. The mirror (M) of thirteen inches focal length and four inches diameter, should then be arranged with its central aperture about the same height as the eye to be examined, and should be placed opposite the face at the other side of the table, about forty inches from the chin-rest. The flame of the lamp (F) should be placed at the same height, distant about thirteen inches in a direct line from the centre of the mirror, and about eight inches to the right or left of a line drawn from the mirror to the chin-

Fig. 1.



rest. The screen (S) should cut off all direct lamplight from the patient; and the stand (G), which carries a square of blue glass, should be interposed between the flame and the mirror, but close to the former, and with the glass at such an angle that it shall not reflect light to the patient. The lens, of eight inches focal length and four inches diameter, roughly set to the height of the eye by the screw at B, is then placed about eight inches from the patient, with its long double handle (H) turned towards the observer, who first so disposes the mirror and lens as to throw a circle of light about the size of a shilling upon the eye of the patient, and then seats himself behind the mirror to complete the adjustments required for a perfect view of the fundus oculi. Whilst looking through the aperture he may impress slight movements upon the mirror, turning it either upon the vertical axis of

its stem, or upon the horizontal axis on which it swings in its gimbal. By means of the handle (H) with its terminal pillar (P), he may move the lens nearer to or farther from the patient, or across the table in such a manner as to transfer the light even from one eye to the other. By causing the pillar (P) to move in an arc he may render the plane of the lens oblique, so as to displace reflected images, and, by the fine adjustment governed by the screw (K), he may regulate the height of the lens with exactness. So complete is the mastery over all parts of the apparatus that a very little practice renders it possible to follow all slight movements of the eye as readily as with a hand-ophthalmoscope, while the resulting image is about four times as large as any that an ordinary hand-ophthalmoscope will afford. The large mirror and the position of the lamp combine to furnish a very powerful illumination, and the absorption of yellow rays by the blue glass renders the light so little irritating that it has scarcely any tendency to produce contraction of the pupil, and

FIG. 2.

that the use of atropine is therefore in most cases unnecessary. The arrangement of the apparatus is shown in ground-plan in Fig. 2, where M shows the position of the mirror, R that of the chin-rest, F that of the flame, with its screen S, and its blue glass G; L shows the lens, and I the position of the inverted image.

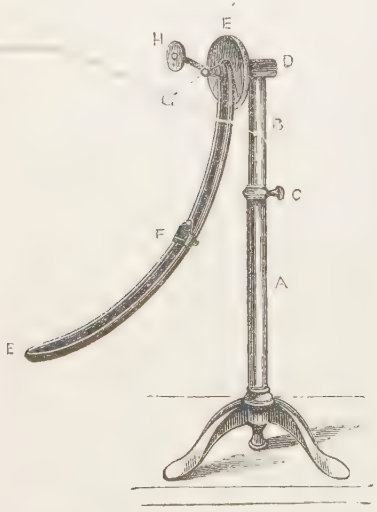
Mr. Jabez Hogg thought the image inferior in distinctness to that which those accustomed to use the ordinary ophthalmoscope are familiar with, and he suggested the use of a tube containing two plano-convex lenses, each of eight inches focal length, and with their plane surfaces outwards, instead of a biconvex lens. He showed such an apparatus.

Mr. Carter said that any indistinctness in the image produced by his ophthalmoscope would be solely due to want of habitude in its management, and to such an error as giving the lens too great a degree of obliquity. He pointed out that Mr. Hogg's compound lens was practically the same thing as the well-known

double ocular of Coccius, now fallen into general disuse; and said that it would certainly cause great trouble from reflected images of the mirror if the lenses were placed at right angles to the axis of the tube. He believed it would be found necessary to place them obliquely, as Coccius had done. He further objected that Mr. Hogg's lenses would practically be a four-inch lens, and that they would therefore give a much smaller image than that of his own instrument, in which the great enlargement was one of the most noticeable features.

Mr. Brudenell Carter showed an improved perimeter, consisting of a simple tripod, supporting a hollow stem (Fig. 3, A), in which a second stem (B) moves up and down, and can be fixed at any desired height by the screw (C). At the top of the stem (B) is a short horizontal axis (D), carrying a quadrant (E E′), which turns in a complete circle, and can be fixed by a screw at any point. On the quadrant is a travelling slide (F), with a white spot; and a second independent axis is inserted in the axis of the quadrant at G, and carries a short tube, in which may be placed a stem to support the fixing point. The second or inner axis makes a complete revolution without affecting the position of the quadrant, and without being affected by it. At its attached extremity the quadrant terminates in a circular disc (E′), which is graduated into degrees at the back; and a fixed index allows the exact position of the quadrant to be read off. The quadrant is graduated on its concave face, from ten degrees to ninety, so as to show the exact position of the slide. The fixing-point may be an ivory knob at the end of a wire, or, what is for most purposes better, a small disc with a central perforation, as shown at H, *through* which the patient looks at an object on the other side of the room, and obtains fixation without exercise of the accommodation and consequent fatigue of the eye. The travel-

Fig. 3.



ling slide (F) may be made to carry a spot of any colour or size that is desired, and is furnished with a ring at the back, by which it may be moved by means of a hook set in a handle, so that its position may not be indicated by that of the hand of the operator. For the purpose of taking exact measurements of the blind spot the quadrant is graduated at the back, from eight degrees to twenty-five, in degrees and sixths of a degree; and a white spot is placed on the centre of the axis (G), to serve as a fixing-point for this special purpose.

Mr. Soelberg Wells: During the last three years I have used one of Förster's perimeters with great satisfaction, the only exception being that the strings are apt to get crossed. I have had no practical experience with Mr. Carter's, but it does seem to me to offer great advantages, and to be more useful for minute investigation, especially with regard to the blind spot, than is the other. It has moreover the practical advantage of not being more than half the cost.

In answer to a question about the position of the patient, Mr. Carter said that it had occurred to him that, in addition to the chin-rest, a rod might be provided to carry a ring which should fit the edge of the orbit, and through which the eye might look.

The President asked Mr. Carter to explain how his instrument differed from Professor Förster's.

M. Brettauer: In comparison with Mr. Carter's instrument, the perimeter of Förster has this advantage, that it effects the fixation of the head more perfectly; which, where exact measurements are required, is an important point. Landolt suggests for this purpose—viz., to secure the position of the patient—the centre of the perimeter should always fall upon Marriott's spot. Besides this, the circle appears to me to be scarcely firm enough, and hence the distance of the object of vision from the perimeter is itself variable. It seems to me that it is high time, after the many changes in the mechanism of the perimeter suggested by Landolt, Schacken, and Carter, to search for the types of the limitation of sight in the various diseases of the eye. In explaining this observation, I would adduce [M. Brettauer here exhibited a number of diagrams] a series of cases; and first those who are amblyopic from alcohol and tobacco-intoxication—in which cases the *external* part of the field of vision is always much more circumscribed than the *internal*, apart from the scotomata well known to exist in such cases. Equally

important is the fact that in hemiopia as measured with the perimeter, the field of vision is divided by a vertical line, as may be seen in the drawings exhibited. Another series of cases are the scotomata that occur in the so-called retinitis nyctalopica of Arlt. They are specially distinguished by the circumstance that the scotoma always extends chiefly outwards from the point of fixation in every eye. I reserve to myself the right of publishing the entire collection.

M. Woinow: It is quite obvious that the half-circle is far easier to manage than the quarter-circle, especially if we intend to examine both sides. The fixation of this instrument is by no means steady. M. Wecker considers this to be unimportant, but it is not so, because the circle has a fixed radius, which cannot be changed. We have to do with the determination of the limit of the field of vision. The blind spot does not always remain the same; and it is therefore better to take the yellow spot (macula lutea) as the centre. It would be well if the patient did not move; but he does so, nevertheless. If, however, we place a small mirror before him in which he can see his own eye, no motion is made as long as he can see the reflection of his own eye. The hole in the perimeter of Carter has probably no special advantage.

M. Donders: The advantages are probably divided. It is of greater importance to know of what kind the examination is to be, either scientifically or practically. In simple examinations concerning the field of vision, for example, the hand alone will suffice. Mr. Carter can have scarcely constructed his instrument for purely scientific inquiries. For the latter purpose I should certainly prefer the instrument of Förster.

Mr. Carter: My own feeling has been that the other half of Professor Förster's instrument was one of its greatest inconveniences. I constantly found that it came unexpectedly in contact with some portion of the patient, and one of my objects was to get rid of the second half of the arc. This instrument is the first made, and is almost an experiment, and many points of detail may be added to it.

M. Wecker: I think that the instrument of Förster's gives excellent results, but one objection to it is that the examination takes so long, that in a large clinique, unless you have an assistant constantly occupied with it, it is scarcely possible to use it except for a few special cases. I have found that "all

mensuration of the visual field must be done with a constant gaslamp. With daylight the same result can never be obtained on successive days.

Mr. Carter: I should like to add, that though a perimeter of perfect mathematical accuracy, absolute fixation of head, &c., would be necessary in taking the field of a person trained to habits of careful observation; if, from an average patient, we get a statement of the position of a moving object accurate within an inch or three-quarters of an inch, it is as much as we can expect. The inaccuracies introduced into perimetry by the habits of mind of the public, with whom we have to deal, are so considerable, that it is useless to try to attain the extreme accuracy which some desire.

On Traumatic Cataract.

By J. R. Wolfe, M.D., F.R.C.S.E., *Surgeon to the Glasgow Ophthalmic Institution, and Lecturer in Andersonian University.*

Since May, 1870, I have operated in the Glasgow Ophthalmic Institution on eighty-two cases of traumatic cataract. These cases were under the immediate care of myself and competent assistants. We have noted the progress of each successful case, and also what we considered to be the cause or causes of each failure.

I am desirous of submitting the result of our observations to this Congress, as hitherto we have little else than the records of isolated cases, and a comprehensive view based on a large experience is still a desideratum. It appears to me, that the various aspects in which this disease comes before us are peculiarly adapted to exhibit the different elements which render ophthalmic operations precarious. Indeed, so many considerations enter into the study of this subject, that, in a theoretic as well as in an artistic point of view, it merits a special classification.

Of the cases treated there were 77 males and 5 females, their ages ranging from five to sixty-one, viz.:—

From	5 to 10	years of age	8
,,	10 to 20	,, ...	28
,,	20 to 30	,, ...	20
,,	30 to 40	,, ...	13
,,	40 to 50	,, ...	7
,,	50 to 60	,, ...	5
,,	61	,, ...	1

Thus the greatest number of accidents occurred between the ages of 10 and 20; after this age the number gradually decreases.

The occupations of the patients were as follows:—

Children and message boys	14
Needlewomen	3
Shoemakers	1
Brass polishers	2
Labourers	6
Miners	4
Granite polishers	2
Smiths, irondressers, and puddlers	9
Mechanics	3
Riveters	15
Caulkers and boilermakers	17
Engineers and engine-fitters	6

The shipbuilding department alone, therefore, furnished forty cases, or nearly 50 per cent. of the whole.

Nature of Injuries and Complications.

Some of these were—

A.—Recent Injuries.

Without penetrating wound	1
Simple punctures	18
Laceration of cornea and iris	22
With hypopion	3
Foreign bodies impacted in lens or ciliary processes	7
Dislocation of lens into anterior chamber (partial)	11
Dislocation of lens into anterior chamber (entire)	4
Dislocation into the vitreous humour	1
Contusion of eyeball	1

B.—Old Injuries.

Simple	3
With anterior adhesions	2
With posterior adhesions	8
Dislocation and adherent lens to decemet membrane	1

Operative Methods.

The methods which I have adopted are the following:—

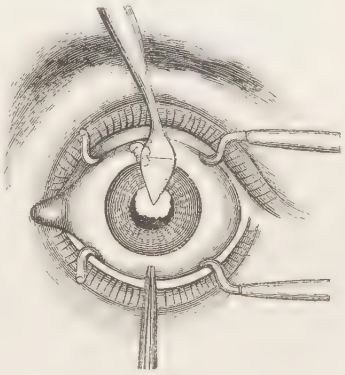
1. Linear extraction with the lance without or with iridectomy.
2. The small corneal or corneo-conjunctival flap.
3. Curvo-linear incision with Graefe's knife.

Fig. 1 represents the linear extraction with lance.

The patient being under chloroform, and the eyelids held open by a speculum, I seize the conjunctiva and the subconjunctival tissues with a blunt forceps, either in the upper or in the lower vertical meridian, at a distance of about a sixth of an inch from the corneo-sclerotic junction. I then introduce the lance obliquely through the cornea into the anterior chamber and behind the lens, pushing the iris out of the way. The aqueous humour escapes, and the lens advances forwards, and is thus pumped out by alternate pressure and relaxation with the forceps on the one hand, and depression of the lance on the other.

If the incision be found insufficient, I enlarge it on each side, and direct the point of the lance towards the débris of the lens which may have remained behind.

Fig. 1.



The lens is thus extracted without interfering with the integrity of the pupil.

If, however, the state of the parts is such that an iridectomy is thought necessary, I introduce the lance in the first instance, more horizontally, making an opening of about a quarter of an inch, and excise the iris. I then re-introduce the lance, and enlarge the opening on either side, enlarging the incision to the extent of about three-eighths of an inch (either by pushing the lance forward, or by pressing it first on the one side, then on the other), and pump out the lens as already indicated.

The reason of limiting the puncture in the first instance is, that after the iris has lost its support from behind, and some of the lens substance has lubricated its anterior surface, it is both apt to fall back and to become slippery, so that it becomes difficult, if not impossible, to seize it with the forceps.

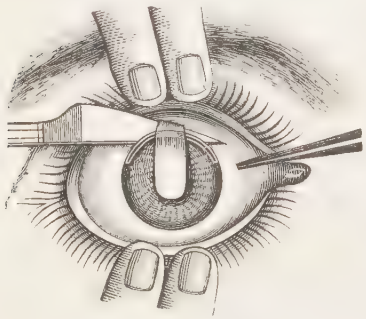
This operation is applicable to cases of young and middle-aged persons, who form the largest class subject to Traumatic Cataract. I have adopted it in forty-nine of the cases referred to.

Fig. 2 represents the corneo-conjunctival flap in the first stage (part of the iris having been previously removed).

It shows at a glance the advantage which we derive from that section in partial opacity of the cornea, when it is our object not to encroach upon any transparent portion.

It is right, however, to state that I do not use the conjunctival flap so frequently as I was in the habit of doing some years ago; but in some of the cases it rendered me very important service.

Fig. 2.

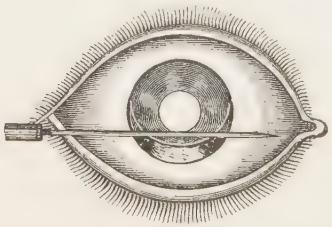


Although this is my favourite method in Idiopathic Cataract, I have employed it only in twenty-four of the cases under consideration.

Linear extraction with Graefe's knife is in some cases much to be preferred to every other method, as represented in the following case :—

Fig. 3.—This is a sketch of the case of Edward Queen, aged twenty, riveter, who was struck with a piece of iron in the right eye. On presenting himself at the Institution in July, 1871, four days after the injury, the lens was found opaque, and presenting an elevated ridge on its surface, and there was pus in the anterior chamber, and infiltrated into the lower part of the cornea. A curvo-linear section with Graefe's knife was made in the lower healthy portion of the cornea, above the suppurating part, and iridectomy performed, thus giving exit to the pus in the anterior chamber and the lens. On the sixth day, the anterior chamber was found clear. The patient could count fingers, but the lower part of the cornea still remained opaque, having a yellowish puriform look. At the end of a fortnight this part had cleared, bringing into view a black point, which was at first sight taken for a shred of the iris, but, on examination, was found to be the point of a piece of iron imbedded partly in the cornea, at its junction with the sclerotic, and partly in the ciliary processes. This was removed, after which the lower part of the cornea became flattened and the pupil contracted. An artificial pupil was made, which resulted in good sight.*

Fig. 3.



These operations I have employed according to the following plan :—

1. When the lens is totally dislocated or broken into fragments, I remove it by the lance.

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* It will be seen from this drawing that I have unwittingly been forced, by divers complications, to adopt a new method, which M. Warlomont explained to this Congress as a new operation.

2. When I judge that the whole lens cannot be removed, I perform iridectomy, removing only the broken fragments, and leaving the rest, which, if not removed by the action of the aqueous humour, may be dealt with subsequently; but in no case would I use a spoon or any traction instruments to remove lenticular débris.

3. When the capsule is but slightly torn, I open it freely with a needle, and then I remove it subsequently.

4. When the iris has been lacerated, I remove the injured portion, and leave the lens, if not dislocated, to be dealt with at a future period.

I would here call particular attention to hernia iridis. If the laceration extend to the ciliary processes, I remove only the injured portion of the iris, and in no case do I interfere with the ciliary processes; but I rather favour their retraction either by compress or suture.

5. In patients of forty-five or thereabouts, where the lens is not broken up, I make an iridectomy, and extract the lens by the small flap at the same time, when urgent, or else at a subsequent period.

In short, the principle on which I act is to stand by the eye as long as possible, and not to do too much at a time, but to proceed safely as far as the recuperative powers of the organ will admit.

6. In a case of dislocation into the vitreous humour, complicated with glaucomatous symptoms, the zonula being ruptured, and the lens within its capsule floating in all directions, following the movements of the eyeball, I operated in the following manner:—

The patient being seated upon a chair, with his head bent slightly downwards, so as to cause the lens to gravitate towards the anterior chamber, whilst I, sitting in front of him upon a lower chair, kept the eyelids open with the finger of the left hand, and with the right I introduced a needle through the sclerotic behind the lens, which I brought forward into the anterior chamber. I then handed over the needle which fixed the lens in that position to an assistant, and made the patient decline his head backwards. I then extracted the lens with the lance.

In speaking of dislocated lenses, I may mention a curious case of dislocation which I have at present under treatment.

Fig. 4.

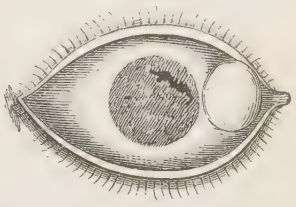

Fig. 4 represents a case which I admitted into the Ophthalmic Institution. The patient is a puddler from West Hartlepool, aged thirty-five, whose right eye was injured seven weeks ago by a scrap of iron. At the outer margin of the orbicularis there is a large nodulated cicatrix where the stroke was inflicted. The anterior chamber is shallow, and the iris dragged

towards the inner angle, and partly atrophied. He can count fingers at the outer angle. At the inner angle there was a large subconjunctival tumour which limited the motion of the eye inwards. I was sure that this could be nothing else than the lens dislocated, and, on opening the conjunctiva, I extracted the lens which was softened. The tumour having disappeared, and the movements of the eye re-established, I shall improve vision by the formation of a new pupil.

Results of the Cases under consideration :—

65 were cured with good sight.
10 „ „ medium sight.
7 dismissed with no sight.
16 required subsequent pupil formation.
6 „ laceration of capsule.
4 „ pupil formation and laceration of capsule.

Causes of Failure.

I think it will be admitted that the opaque lens in cases of traumatism may hide damages to other structures, so that it becomes impossible to say beforehand what the extent of the injuries may be. We may find choroidal vessels ruptured, vitreous softened, retina detached, &c. Indeed, I need not refer to complications which will readily suggest themselves to every one. I may signalize here, however, what I consider the principal causes of failure—namely: *First*, The impossibility of removing the entire lens. Instead of the lens being dislocated forward, and becoming softened by the aqueous humour, the centre, or a portion only, is damaged, and the rest is compressed towards the meridian of the eye, where it forms adhesions, so that no pressure would dislodge it. Slow choroido-iritis is the inevitable result. I am quite satisfied that a larger section in these cases would only facilitate the escape of the vitreous, but not the exit of the lens substance; indeed, in such instances there are peculiar features of the eye—a physiognomy readily recognisable, and indicative of deep-seated structural changes—viz., cloudiness of aqueous humour—dry look of the iris, if not actually amounting to change of colour, injection of the ciliary circle, causing an appearance of constriction—a muddy look about the cornea; but the appearance of the lens is particularly noteworthy. In favourable cases it is tumefied, and the other tissues are only thus far implicated, in their attempt to extrude that offending substance; whilst in unfavourable cases, the capsule is thickened, and the lens is considerably shrunk and grasped by the gorged iris, zonula, and ciliary processes. In short, in the one case the lens acts as an irritating foreign body, while in

the other all the deep structures are more or less implicated, and the lens itself becomes atrophied, and has no active share in the inflammatory process. Permit me to remark here, in passing, that the greatest objection which can be urged against all those methods of extraction of the lens by a small incision is, in my estimation, to be found in the phenomenon just referred to, for wherever extreme pressure is requisite for the accouchement of the lens, we can never be certain that the entire lens has been removed; and when considerable fragments of cortical substance remain behind they are sure to show their existence by the appearance of slow iritis.

The *Second* cause of failure may arise from the severity or peculiarity of the injury. As an instance I may refer to cases of accident with coal. Generally, when a piece of iron or granite lodges in the lens, even after laceration of iris, or even when the eye has been contused, the lens is extracted, and all ends well. But I have observed that when an eye has been struck with a piece of coal, however slightly, onyx and hypopion are the result; and when the coal had penetrated the anterior chamber, suppuration of the globe is certain to ensue. Indeed, I have such a respect for coal accidents that whenever they present themselves I am inclined to abstain from surgical interference, and would wait for weeks to see the issue of the case, rather than share the responsibility with this potent agent.

Fig. 5.

In comparing the issue of these accidents, therefore, with the treatment which the cornea receives in the process of tinting, or in gunpowder explosions, when the epithelium is singed, and particles of powder are embedded even in the cornea proper, without causing suppuration, I was inclined to ascribe the serious results from coal accidents to chemical causes; but on consulting with our eminent chemist, Professor Bischoff, of Glasgow, he expressed it as his opinion that the effects of coal dust upon the cornea must be due to their physical or mechanical characters—viz., to the shape of the fragments of coal dust. He says, "In order to ascertain this I pulverized a lump of coal, separated the finest particles by repeated decantation. After allowing the liquor to stand for twenty minutes, I filtered it through paper, and thus obtained the very finest particles. I

mounted part of the dust with Canada balsam on a glass slide, and on examination under the microscope, my anticipation appears corroborated. The particles of coal dust have the greatest resemblance to glass-shivers; they have almost, without exception, extremely pointed angles and sharp edges. I leave it for you to decide whether this may account for the irritation produced."

For my own part I am inclined, provisionally, to accept this explanation until more light be thrown on the subject.

In thus reviewing the results obtained in the cases under consideration, and seeing that in pretty nearly all the accidents the old flap operation was quite inapplicable, I am inclined to think that modern ophthalmology, with its improved operative methods, has contributed a considerable share towards the achievements of conservative surgery. But it is essential, in our attempt to save vision from the débris of injured eyes, not to trust to one favourite method only, but to study each particular accident *per se*, and choose the operation best adapted to each individual case.

Mr. Power: I should like to ask how Dr. Wolfe proceeds to treat a peculiar form of traumatic cataract of which I have seen several cases. A piece of iron thrown off by the hammer has passed through the cornea and entered the lens. For several weeks little inflammation is set up, the lens remains clear, but in such an eye the opacity gradually progresses, and ultimately the iris becomes affected. In this case you may either remove the whole eye, which the man is not perhaps very much disposed to permit, or you may proceed as in the ordinary operation for cataract. I should like to know, as Dr. Wolfe has seen so many of these cases, what course he would adopt.

Dr. Wolfe: Saving such an eye is quite out of the question. There is nothing but enucleation. The only time that such an eye can be saved is when we see that the lens alone is suffering, the lens alone is swollen and acts as a foreign body, and by removing it, all the other structures being healthy, we may hope to save the eye. It is remarkable that when the other structures get involved the lens seems passive; instead of being swollen it is atrophied, and it is impossible to try to save the eye or extract the lens. Any section will bring away the vitreous and many other things but never the lens.

Mr. Vose Solomon said that the result of his observation in such cases as those alluded to by Mr. Power was, that whenever a particle, however minute, gets into the lens itself, and however

free the eye may be from inflammation, the lens should be extracted without a moment's delay.

Mr. Hulke: Did Mr. Power say that the presence of a minute foreign body in the lens, no other structure being damaged, opened up the question of the removal of the eyeball? I would also ask Dr. Wolfe whether he said that the presence of a foreign body in the lens with supervening iritis justified the excision of the eyeball. If I understood him right I think he is going much further than we are warranted in going. Many an eye may be saved in which a foreign body is embedded in the lens and in which there is some iritis.

Dr. Wolfe: I quite agree with what Mr. Hulke has said that slight iritis setting in after a foreign body is embedded in the lens is an indication for the removal of the lens. What I intended to say was that there was a peculiar physiognomy of the affection of the eyeball in which the iris gets a peculiar dry look, not seen in ordinary inflammation, which indicates a condition of choroido-iritis. The capsule is thickened, and we see that there is much acute inflammation. The lens is rather shrunken than inflamed, and an attempt at extraction is useless because the lens will not come away. It remains strongly adherent. It is my practice to stand by the eye as long as possible, but in such cases I have found enucleation to be the only course.

Mr. Hulke: It seems to me that in all cases of traumatic cataract in which Dr. Wolfe removes the lens he does so by a large section. In a large number of cases in which operative interference is necessary we may get a better result by another method. In young persons in whom the lens is soft we have an admirable method of getting rid of the lens by a small corneal incision and the use of a suction instrument. I am not disposed to recommend the indiscriminate use of suction instruments, because I have seen it attended, in the hands of others, by very disastrous results. I would reject *in toto* all kinds of syringes, falling back on the original instrument of Mr. Teale, which is a simple tube with an india-rubber tube attached by which you can suck by the mouth and appreciate nicely the tension put on. Working thus, and only in the area of the dilated pupil, I have never seen any ill-effect. In a large number of cases to remove a lens rapidly swelling and causing tension and pain there is no better method.

Dr. Wolfe: Out of eighty-two cases forty-nine were operated

on by a very small corneal incision; only in old persons did I make a large corneal incision. There is not much difference between the small incision made by an iridectomy knife and the incision made for the suction instrument. For my own part I object to the suction instrument on principle. I have never tried it and I never will.

Mr. Power: The cases to which I referred are those in which a minute fragment of metal had entered the lens, but had not rendered it entirely opaque; there being only a little opacity around the piece of metal. But coincidently with that, iritis and sclerotitis are established, and, in fact, general inflammation of the whole globe. The patient, however, may not have lost his sight, and the question is whether you are to recommend him to have the globe removed or the cataract extracted? If the latter there is great risk of failure; whilst if the eye be allowed to remain there is the risk of sympathetic ophthalmia, which I think highly probable in such cases.

Mr. Jabez Hogg mentioned a case in which the removal of a lens in which a piece of metal was embedded had been followed by complete success.

Mr. Hulke: The question just put by Mr. Power is widely different from his first question. His first was, what do you do in the case of a small foreign body in the lens with partial opacity, the other tissues being healthy? The last was, what do you do in the case of a foreign body in the lens, the lens becoming opaque, and all the tissues around inflamed?

The President: I think that in the case Mr. Power mentions, if there be no irritation you need not immediately perform the operation. It has been observed that there is a reason why an exudation into the anterior chamber, with wound of the lens, always has such bad results for the eye. The exudation into the anterior chamber is of plastic substance, and there is a second substance from which fibrin is formed, which is supplied by the globulin of the lens. If the lens were not wounded much less serious results would follow.

Mr. Teale: I should like to make a few remarks on the question of traumatic cataract bulging into the anterior chamber, with affection of the iris without much exudation. My experience confirms what Mr. Hulke says, that the most easy and simple method is by the employment of a suction instrument. It is nothing that many have tried it and failed—we must take

it on the evidence of those who have tried it and succeeded. Where there is so much exudation and alteration of the lens, that it does not readily come out, my own experience has been that it is better to iridectomize, and leave the lens, and to remove the lens at another time, than to try and get the iris quiet by removing the lens altered by exudation.

The President: I will now call on Dr. Pagenstecher to speak.

Dr. Pagenstecher: I have the honour to submit to the Congress a work upon which I have been engaged for some years past, in conjunction with my friend, Dr. Carl Genth, of Langen-Schwalbach. It is an attempt to give a faithful representation of the anatomical and pathological changes that take place within the eye; and the Atlas containing our drawings has been exhibited during the present session on the adjoining table. We have been fortunate in having at our disposal not only the rich material of the Augenheilanstalt of Wiesbaden, but the large collections of the museum at the Ophthalmic Hospital, Moorfields, as well as those of Dr. Baden and Dr. Liebreich, who have most liberally placed their specimens at our disposal, and to these gentlemen we desire to express our grateful thanks. We have also received the kind co-operation of several German and French colleagues. We have been particularly anxious to reproduce the exact appearances presented to the naked eye, or in the very slightly enlarged image, and the microscopical characters have been only so far depicted as to give a clear idea of the various stages of disease. We are convinced that both teachers and students will reap great advantage from this work, inasmuch as the larger number have only the opportunity of observing a relatively small number of specimens. Unfortunately, as may easily be conceived, the expense of publication is considerable, though this might easily be removed if we could obtain the promise of subscriptions to the work by a certain number of oculists. The present Congress appearing to afford a favourable opportunity for such subscriptions, we have ventured to place the work before the meeting. The plates will be accompanied by an explanation in the English and German languages.

Friday, August 2.—Afternoon Sitting.

M. DONDERS IN THE CHAIR.

Case of a Monster with the Eyes Covered with Skin Kryptophthalmia.*

By W. Zehender, M.D.

In September last year, a child, six months old, and said to be without eyes, was brought to my clinique. The sex of the child was doubtful, but it had been baptized Caroline. The parents, who were not blood-relations, were healthy and well developed, and the present was their only child.

The formation of the head of the child is, as far as can be recognised by touch, quite normal. The margin of the orbit is flatter and less prominent than usual, but there is no palpebral aperture, the skin of the forehead continuing without interruption over the eyes. Only a slightly marked furrow, more developed on the left side than on the right, indicates the place on both sides where the palpebral aperture ought to be. In the position of the right outer commissure there is a small softish swelling above the "processus frontalis" of the malar bone, projecting somewhat into the cavity of the orbit. On pressing this tumour the bone beneath it can be felt, and it can be made out that it rests on the orbital surface of the malar bone. Above the tumour is a deep depression, fully 1″ in length, and ½″ in its greatest breadth. In the corresponding place on the left side there is a similar but less developed tumour. The place of the eyebrow is marked only on the right side towards the temple by the presence of a few white tender hairs. Near the above-mentioned tumour, but in a position inwards and a little upwards, one can feel beneath the skin, better on the right side than on the left, a little moving eyeball. On the right side some sensation of light is plainly felt; on the left there is no trace of it. If the child is brought to a light window, a frown such as would be produced by pressing the eyelids together, is seen, and the furrow above described becomes more perceptible. On shading the right eye the frown disappears, to appear again and again on removing the

* Translated by Mr. Cowell.

shade. The same experiment with the left eye, whilst the right is shaded, does not produce the slightest change. The left eye therefore is quite blind; the right, on the contrary, has active, quantitative sensation of light. On making the same experiment with a candle, the child moves her hands towards the place from whence the light comes, as if the light was disagreeably felt, and also by other gestures shows the same sensation.

Some other abnormalities are found in the child:—1. A gastrocele, larger than a man's fist, extends from the umbilicus over the mons veneris, and shows clearly through the fine bluish-red integument the winding of the intestines. 2. The genitals are undeveloped, but sufficiently so to enable us to recognise a female child. 3. There seems to be no perineal sphincter, as there is incontinence of urine and fæces (the latter are always fluid). 4. On the right hand the three last fingers are grown together, the forefinger with the middle finger as far as the third phalanx, and the thumb with the forefinger. On the left hand the deformity is not so great; nevertheless, it extends to the first and second phalanges of each finger. On the toes the same anomaly is present; the great toe on both feet is free. The child's voice is heard only in short high tones, which at times have a peculiar mixture of hoarseness, and are apparently uttered with some difficulty. They are heard only when the child is incommoded. The whole face then presents the appearance of that of a crying child, tears being naturally out of the question. In such moments the child strains violently, the respiration becomes laboured, and the gastrocele is pressed forwards, so that the thin skin covering it becomes tense and shining. The child takes the mother's breast willingly, and its body is otherwise well developed.

The child died in consequence of disturbances of digestion on the 4th of December, at the age of nine months.

Dissection twenty hours after death.—Body well nourished, 60 centimetres in length; rigor mortis fairly marked; skin pale; slight hypostasis. Skull short and broad, covered with scarce, thin, light hair. The frontal bone in its lower half takes a strongly marked direction backwards, making the root of the nose appear much depressed. The eyebrows are absent, but in place of them there are on both sides a few short, thin, pigmentless hairs. Both orbits are covered by the continuation of the cutis, without palpebral aperture. The skin over the orbit is thin, slightly transparent, and almost destitute of fat. It shows a similar condition on the left side of the nose, where it forms a small somewhat deep fold. At the outer and lower part of the right orbit, near the upper angle of the malar bone, the cutis forms a prominent fatty fold. The nose is rather large, and between its middle and lateral cartilages a slight interruption is felt. The external ears are normal. Throughout nearly

the whole length of the linea alba there is a considerable separation in the skin of the abdomen, which is vaulted over by a gastrocele larger than a goose's egg, through which the winding of the intestines and the bladder can be felt. The ovaries are both well developed; the right is two centimetres long, 0·75 broad; the left 1·72 centimetre long, 1 centimetre broad, and its upper border is level with the crest of the ilium. In the right ovary, microscopically examined, numerous follicles are found. The Fallopian tubes are at their outer ends distinctly fringed, and at their inner ends, near the lower border of the ovaries, both show as indication of a uterus a solid club-like swelling, which is continued on both sides to the inguinal canal as the round ligament. The recto-vaginal pouch, lined with peritoneum, is empty. The nymphæ and clitoris are normal, and behind the clitoris there is a blind folded pouch, into which the urethra opens, but surrounding these are two widely separated prominent protuberances continuing into the nates.

The parietal eminences are well marked; the dura mater is everywhere strongly adherent, but transparent, and the sinuses are filled with blood. The pia mater is a little œdematous and congested. At the base of the brain it is remarkable that the anterior border of the pons Varolii approaches the optic commissure. The position of the pons, the medulla oblongata, as well as that of the optic commissure, is also remarkably steep; and even the anterior lobe lies less horizontally than usual, so that the angle at the corpora mammillaria is less than normal, and is about equal to a right angle. The optic tract is somewhat flattened, and the brain substance is a little œdematous, firm, and contains a medium quantity of blood. The lateral ventricles, not specially wide, contain no serum. All the parts at the base of the brain and the cerebellum are well developed. The base of the skull is normal. The right optic nerve is, as far as it runs in the skull, a little thicker than the left. The ethmoid bone is strikingly deep; on each side of it, the roofs of the orbit project a little in the form of roundish prominences, the right being higher and broader than the left. The cuticle which covers the orbits having been removed, the orbits are found to contain a transparent bag, about the size of a hazel nut, filled with a pale yellowish fluid, behind which on the left side, grown together throughout, is the globe, quite atrophic, and about the size of a bean. The apparently normal muscles are attached to the rudiments of the globe. On opening the bag, which is filled with pale yellow serum, and which may be regarded as the conjunctival sac, the shrunken globe appears at the bottom, the anterior surface of which shows the cornea in folds. In the right orbit the same appears, but the globe is less atrophic. The globes, with their surrounding parts, were preserved for special examination.

ANATOMICAL DESCRIPTION OF THE EYES BY PROFESSOR MANZ.

The eyes of the monster were sent to me in January last year, after they had been lying in Müller's liquid since the beginning of December of the preceding year. The measurements of the unopened globes were as follows :—*Right eye.*—Antero-posterior diameter, 30 mm.; transverse diameter at base of cornea, 17 mm.; largest diameter across cornea, 19 mm.; transverse diameter near the equator, 18·4 mm.; diameter of optic nerve without sheath, 2·6 mm. *Left eye.*—Antero-posterior diameter, 10 mm.; transverse diameter, 16 mm.

There is nothing abnormal in the size and arrangement of the outer muscles of the eye, which are enveloped in cellular tissue containing fat, or in the nerves and blood-vessels belonging to it. The muscles may be said to be strongly developed, but the point of their insertion into the sclerotic is further from the cornea than usual. For the recti, for instance, the distance is 10 mm. instead of 5·6 mm., the usual distance in new-born babes. The sclerotic, posterior to the insertion of the tendons, is of firmer texture than the anterior portion of the sclerotic and the cornea. Of special interest in reference to the ocular muscles is the extraordinary development of the levator palpebræ, the insertion of which is not in a free eyelid, but in a fibrous plate, which becoming thickened by the addition of many transverse bands, unites by a loose tissue with the surface of the cornea—a union which becomes narrower and more intimate, and extends far into the cornea. Beneath this plate a soft fatty tissue is interposed between the insertion of the muscles and the parts surrounding the cornea. In the left eye, where the muscles have been more disturbed, no levator was found.

For the purpose of examination, the right eye, after having been two months longer in the Müller's liquid, was cut in its horizontal meridian. Only a small collapse followed and no visible derangement of its contents. The anterior chamber was very large and the lens was absent. Between the anterior chamber and the rest of the cavity of the globe was an iris-like septum. The depth of the anterior chamber was 12 mm., and that of the posterior was 14 mm. The diameter across the septum was 12 mm., showing a constriction between the two divisions, which was scarcely recognisable on the outer surface of the globe. The septum was nearly opposite the commencement of the cornea, and appeared as a greyish membrane stretched across the globe about the thickness of an iris, containing an irregular excentric opening 4 mm. in breadth. The nasal part of the septum measures 6 mm.; the temporal only 2 mm. Both chambers are equally filled with a jelly-like, laminated, slightly transparent mass, resembling a vitreous body as generally seen in a hardened eye. No difference can be recognised, even with the microscope, between

the granular structureless contents of the two divisions, which separate easily from the tissues of the eye. There is no trace of a hyaloid. The separation is more difficult and less clean in the anterior chamber, portions of the vitreous remaining attached to the cornea. In the peripheral portions of the vitreous, in the posterior part of the globe, there are numerous cells dispersed, some round, others branched with long processes, but all with a coarse-grained protoplasm and a roundish, vesicular nucleus. Some contain two nuclei, but no cell-membrane can be found. In the middle part of the organ such cells do not exist, or occur very sparingly. There are also no vessels. On carefully removing the vitreous body from the back of the septum a membrane is detached with it, which is adherent to it and also to the ciliary body, but can be taken off as a whole. This membrane is the zonula with a structureless layer, in front of which are thin, broad, sharp-edged, and slightly curved fibres. The anterior ends of these fibres seem to extend to the free border of the septum; and upon and between the fibres are cells such as are described above, besides irregularly scattered pale yellowish globules of different sizes, sometimes seen exuding from the end of a broken fibre of the lens. These cells are structureless, without either membrane or nucleus, and divide, under strong pressure, into smaller spheroids; but do not contain granules, as is the case in the surrounding portions of vitreous. In fact, one soon finds that the cells, though mingled together, are very different, and that these contain lens substance. On removing the zonula from the septum, the latter at once loses its stiffness, becomes brittle, and is with difficulty obtained in large pieces. The microscope shows the above-mentioned cells, some of which are ·1 mm. in diameter, some less, bound together in groups. Besides these there are irregular polygonal bodies, of the same size, but more flattened, lying upon each other like a number of glass fragments, in which there is often an oval or round nucleus of ·014 mm. in diameter. In some of them an immeasurably fine membrane rises from the structureless mass. It seems therefore that we have to do with large cellular elements, whose derivation and genetic relation first became clear after making vertical sections from the pseud-iris. That I had not a real iris before me, I recognised already from the fact that it could be separated easily and with flat borders from the corneo-scleral-junction, or more correctly from the groove opposite the constriction which divides the globe into two portions. A vertical section through this groove shows externally a structureless membrane on which are arranged a single layer of epithelial cells, squared and possessing one nucleus each. The size of the cells varies with their position, ranging from ·018 mm. to ·025 mm. in diameter. Towards the posterior surface of the septum the epithelium ceases. Beneath the

layer of epithelial cells are short curved lens fibres, increasing in width according to their distance from the capsule, and containing each an oval nucleus. The direction of the lens fibres is from behind forwards, the inner ones losing their curve and running parallel to the septum. We have then here the "whorl" long known from the account of the development of the lens by E. O. Becker (*Arch. f. Ophth.* ix. 2).

A number of consecutive sections at different parts of the border of the septum show the same conditions, and we may admit in our case the existence of a completely closed zone (the so-called nuclear zone, H. Meyer), as is normally the case.

Internal to the border the appearances presented differ, and this is most marked where the septum emerges from its furrow and increases in thickness. At some distance from the capsule the lens fibres become suddenly broad, retaining parallelism for a time and then losing it. The flat fibres become larger tubes, presenting the characteristic round nucleus. The latter is larger here than in normal fibres, moderately finely granulated, and contains from one to six nucleoli with sharply defined cell-wall. The contents of most of these tubes are homogeneous, often more or less divided; others, on the contrary, are wholly or partly filled with round smooth little bodies, of the size of colourless blood cells. The membrane is here also fine and structureless. To the inner side of these tubes and also between them lie large and small amorphous masses, which approach more and more the albuminous spheroids before seen in the fore part of the vitreous body. Nucleus and cell-wall are only exceptionally to be found, the former, however, more frequently than the latter. With these layers the specimen for the most part ends towards the centre. But in many I found, as a slight deviation from the above, roundish groups of smaller cells or degenerate lens fibres, completely enclosed by normal ones or somewhat enlarged. Such groups were not rare, and were scattered through the whole septum. According to this description it cannot be looked upon as an iris, to which from its position and form it would seem to correspond, but as a rudiment of the crystalline lens, completely perforated at one place, producing apparently a pupil, through which, leaving the separation by the zonula out of the calculation, the similar contents of the anterior and posterior portions of the globe communicate. There is no real iris, but at most the projecting ridge between the cornea and sclerotic could be regarded as an indication of one. This possesses, moreover, a similar structure, mainly formed of bundles of connective tissue, which bend in acute angles towards the cavity of the globe. There are no cellular elements or pigment. From this ridge a thin skin can be drawn off, which forms the back layer of the cornea, and first appears as a slightly developed "ligamentum pectinatum," which more

anteriorly forms a homogeneous thin membrane of Descemet, presenting the usual single layer of flat polygonal epithelial cells. Shreds of the membrane of Descemet show on the epithelial layer of their inner surface numerous cells and groups of degenerated colossal lens-cells containing nuclei, similar to those contained in the septum, only in a thinner layer, with which again the vitreous body filling the anterior division of the globe is in contact. In this last I found some cells, but none containing nuclei.

On the inner surface of the cornea some ridges project at the temporal part, which form the rudiments of the iris, advance towards the front, and show the same structure as the cornea. This, especially posteriorly, can easily be separated into layers, and sections through it show a well-marked lamellar structure, whilst in front there is more or less of an interlacing of fibres. These consist of compact, short waving fibrils, as also do the laminæ of the back layers of the cornea. No other elements exist here, and there are very few vessels, but the long maceration is not favourable to the discovery of cellular elements. This simple and regular arrangement and the waving ending of the fibrils present a remarkable difference from the normal cornea, and approaches more the structure of a fascia or tendon. Nerves and elastic tissue are altogether absent. In front of the cornea these fibrils form, as mentioned, bundles interlacing into close plexuses, which pass into a looser connective tissue covering the front of the cornea and form the union between that structure and the cutaneous layer; and hence may be regarded as subcutaneous cellular tissue. There is much more of it towards the margins of the cornea than at the middle. There is no proper conjunctival sac. In this cellular tissue lie some blood-vessels of different sizes, of a cellular structure, and partly filled with blood corpuscles. Upon many of the broader bands of connective tissue lie striæ of epithelioid cells containing nuclei, which must either be regarded as undeveloped blood-vessels or as endothelial sheaths. I have to add that the thickness of the cornea at its border is 0·7 mm., and that it diminishes somewhat towards the anterior pole.

The choroid, of normal thickness throughout, is but loosely united with the sclerotic. A closer union exists only at the ciliary body, and close to the entrance of the optic nerve. It can be easily divided into two layers, of which the inner contains the chorio-capillaris, with the pigment epithelium, whilst the outer one again can be easily divided into two layers—one a very fine, loose membrane, the supra-choroid, and the inner considerably stronger, the choroid proper, both being free from pigment. The supra-choroid is a narrow-meshed net of many fine interlacing fibres, and contains but few, mostly large pale cells, with several pro-

longations and oval nuclei, as well as dark-edged nerve fibres. The latter mostly lie together in bundles, and hold between them spindle-shaped cells, with long fine thread-like processes. On closer observation, fibres are found here and there, which enclose stroma, by or in which lie longish nuclei, enveloped in a little finely granulated protoplasm.

The choroid proper is a dense tissue, rich in cells, and containing larger blood-vessels and many nerves. Its fibres nearly all contain stroma, and form interstices in which there are many divisions of fibres. There are no fibres holding pigment.

The relation of the choroid with the ciliary body is normal in all essential points; to this the outer layer is firmly attached, and in it many pale longitudinally striated fibres are found, which are partly very long, and as much as ·018 mm. broad, and represent bundles of organic muscular fibres, which cannot well be isolated, and do not show clearly the nuclei, as can hardly be expected after the continued effect of chromic acid. The ciliary body is on the whole much spoilt; the processes—I counted about forty of them—are low, 2 to 3 mm. long, covered by a layer of pigment. On removing the inner layer of the choroid with the ciliary processes, it is seen that this is continuous with a very fine membrane which covers the posterior surface of the septum, and throughout which also some pigment striæ extend. A little behind the cornea the outer layer of the choroid is more closely united with the sclerotic; at this point lies a wide annular sinus (Canalis-Schlemmii), and much genuine fibrillar connective tissue.

As far as the retina was accessible to microscopic examination it appeared to be normal. Whilst the inner layers appeared to be pretty well preserved, only the remains of the rods and cones were left, bearing witness to their existence, though their structure could not be clearly made out. Vertical sections treated with weak carmine solution showed the well-known three coloured stripes, the radiating fibres well-developed, the internal and external limiting membrane markedly standing out; and amongst the fibres of the optic nerve are somewhat shrunken ganglion cells, and undoubted nerve fibres. The existence of the latter is shown in the examination of both optic nerves, of which transverse sections treated with carmine or chloride of gold gave decisive colouring. Both optic nerves are surrounded at their entrance with a strong sheath 3·5 mm. in thickness.

The left eye, which had been opened when it was removed, shows a globe shrunken in all its diameters, with an irregular opening near the iris, through which project fragments of a completely separated retina. The inner space covered with a shrunken choroid contains a little watery fluid and the retina. Upon the inside of the ciliary body lies an amorphous

plug obstructing that opening, and consisting of degenerated elements of the retina; especially striking in it are long flat fibres originating amongst the radiating fibres. On the anterior surface of the globe are the remains of a membrane which might be a conjunctiva, but there is nothing to be found of a cornea.

There is no doubt that in this eye the destruction was not all artificially produced by the removal of the globe, but has partly been produced during life, and either belongs to the fœtal period, or to the short time during which the child lived after its birth. The atrophic condition of the retina shows that its detachment did not originate specially from the enucleation, or in the last moments of life, but is essentially the same as is gradually developed in every detached retina. On the other hand, it may be concluded from the integrity of the optic nerve that this detachment did not occur at a very early period. In any case these lesions did not occur in a normally developed eye, but in a deformed one; the left eye perhaps representing the right in an atrophic condition; this appears also from the observations made by Dr. Zehender at the enucleation, whereon he writes:—"After removing the skin-covering from over the orbits, a vesicle was seen, filled with watery fluid. On opening this, instead of the expected cornea, I found a thin folded membrane," &c.

Whatever may be the relation between the two eyes, it is clear that we must, so far as the characters of the deformed cornea are concerned, keep only to the right eye, in order to come to a clear understanding.

With regard to the missing eyelids, the supplementary examination of the skin of the face has confirmed their deficiency. On the inner side of the skin, neither lids nor palpebral apertures are to be found, but only a considerable thinning, which principally affects the subcutaneous cell-tissue, but also the cutis marks the place when this was lying over the cornea. Similarly all the organs belonging to the lids are absent—eyelashes, lachrymal gland, and lachrymal ducts; only the muscle exists. On the left side I could prepare a well-developed orbicularis in its full extent; on the right only parts of it could be found. The inner and outer divisions are well marked.

We have therefore not a rudimentary formation or growing together of the lids, but a total absence of them. The above description shows that the skin extended over the eye, and was connected with its surface by a subcutaneous cellular material, not limited by a closed cavity. The absence of lids prevented the formation of a conjunctiva and of a conjunctival sac, whilst the development of the muscles starting from another layer was not disturbed by it.

Why the formation of lids, or rather their beginning, the folding of

the outer skin, did not appear, I know no reason; but this will be further discussed.

Amongst the abnormalities of the globe, the absence of a crystalline lens and the filling of the anterior chamber with vitreous are the most prominent, and probably stand in causal relation to each other.

This consists, I believe, in the fact that the lens, partly developed, in a histological sense degenerated, and that thus the vitreous humour developing in the posterior division of the globe extended also to the anterior, which otherwise is separated from it by the lens. That the lens was commenced upon a normal basis is shown in the structure of its rudiments, extended between the anterior and posterior chambers. There are the traces of a partly normal formation of the lens, and it is necessary to show why it was disturbed; for that it was not an after-destruction continuing from the centre to the periphery, is shown by the relative position and form of the lens elements. From another point of view it might be said that the abnormal overgrowth of the vitreous was the primary affection, and its pressure on the lens the cause of its destruction. Against this hypothesis is the fact that the rudiments of the lens are found in the normal position, though some fragments of it are also found near the cornea. But it is not necessary to accept for it a passage through the vitreous, since we know that during the greater part of the fœtal period the lens is in immediate contact with the cornea, and that no anterior chamber exists. The well-defined difference between the two substances prevents the hypothesis of a metamorphosis of lens fibres into vitreous substance, between which, moreover, even for the final products of lens degeneration, no histological transitions exist; chemical differences may perhaps appear with carmine colouring, and already the colouring of Müller's liquid has produced well-marked difference. The vitreous body takes up the carmine less readily and less equally than the lens substance.

Lastly, the most probable hypothesis is that through the degeneration of the developing lens fibres the vitreous, which the history of development teaches penetrates into a space between the lens and the internal lamina of the secondary eye-vesicle, was able to press forward into the anterior chamber, formed by the perishing of the lens, and forces a space between the lens and the inner layer of the secondary eye-vesicle. One circumstance alone makes me doubtful about this hypothesis—namely, the fact that at the point where the lens septum is missing—the apparent pupil—a sharp separation exists between the vitreous in the anterior and posterior chambers of the globe; this separation, partly marked by a slight transparent membrane—atrophic zonula—gives the impression that at a certain time the partition had been perfect, and later had been destroyed.

There is no doubt that the defective formation of the ciliary body and the absence of the iris, are only of a secondary nature, since we know that the development of these organs follows that of the lens. In speaking of the absence of the iris, I do not mean it in the strictest sense, because the before-named ridge, projecting from the sclerotic, can be considered as its rudiment; and we know by the beautiful researches of Kessler* that the iris is not only an outgrowth of the choroid, but that it is of double origin, partly arising from the cephalic laminæ surrounding the globe, and partly from the secondary eye-vesicle, in such manner that its front layers are derived from the former and its posterior cellular covering from the latter.

All the deformities in this case, amongst which may also be counted the abnormal structure of the cornea, belong to a later period of development of the eye: this is evident from the fact that the original formation of the organs of sight, the eye-vesicles and their formation, have not been disturbed. As far as my examination goes, the retina, optic nerve, and pigment epithelium are quite normal, and thus is recorded an interesting proof of the independency of the formation of these parts of the eye upon the others constituting the globe. The disturbance in the development of these latter would therefore fall in the third or fourth month of embryo life.

As to the question of a causal relation between the lid anomaly, which we would call kryptophthalmia, to distinguish it from the simple absence of lids, called ablephary, and the intra-ocular anomalies, it is sufficient that the formation of the lens stands in genetic connexion with the epidermoidal skin covering, and that some cases of congenital coloboma of the lids indicate a certain relation between cornea, conjunctiva, and eyelids. Yet these facts on nearer examination do not suffice to explain fully a causal relation in this case. The development of the lens, as far as it depends on the existence of the corneal membrane, was in this case, at the time of the formation of the lid, long finished; even the much later formation of cornea had not been essentially disturbed, though its form as well as its structure had been in some degree altered, perhaps by the influence of the pathological changes taking place in the interior of the globe.

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* L. Kessler: "Examinations of the Development of the Eye."

Case of Unilateral Irideremia, apparently of Traumatic Origin.

By D. Argyll Robertson, M.D., F.R.C.S.E., *Edinburgh.*

A. M., saddler, fifty-eight years of age, was sent to me in the summer of 1871 to be examined on account of a peculiar appearance his right eye presented.

The man stated that when three years of age he wounded his right eye with a penknife. Severe inflammation followed, which slowly subsided, leaving a small speck on the cornea, which still exists. The sight was also considerably impaired, and as far as he can judge it is at present no worse than it was immediately after that accident. With the exception of the spot on the cornea, the right eye appeared coloured exactly like the left until he was about eighteen years of age, when one day while playing with a fellow-apprentice he received a blow on the right eye, one of his playmate's knuckles being "thrust into the socket of the eye." Severe inflammation followed this injury, with "great swelling of the eye and lids," which lasted about two months. He is positive no operation was performed, only lotions and blisters being employed. Nothing was removed from the eye, nor was there any wound of the eye, but he was of opinion at that time that "there was something burst in the interior of the eye," but he does not remember any water having come in a stream from the eye either at the time of the accident or after it. This injury did not further impair his sight in that eye. After the inflammation had subsided the coloured part of the eye was noticed to be absent, the pupil appearing to occupy the whole of the clear part of the eye. This has since never undergone any change. He cannot say how long he has had a divergence of the right eye which at present exists, but he has noticed for many years that after looking with both eyes open at a distant light, on shutting his left eye, the light appeared a considerable distance to the left of the position it previously occupied. In a bright light the right eye is instinctively kept almost completely closed.

Examination.—*Left eye.*—The pupil of the left eye is small (about 1 line in diameter) and mobile. The iris is of a light bluish-grey colour. His left eye is hypermetropic. With + 36 V. $-\frac{2}{20}$.

Right eye.—There is divergent strabismus of the right eye, about 2 lines in degree.

At first glance the right eye has much the appearance of one in which the iris is very dark-coloured and the pupil has been fully dilated by atropine, contrasting most peculiarly with the contracted pupil and light-coloured iris of the left eye. Looking at the eye more closely, there is the

appearance of an ill-defined pupil about 2 lines in diameter, formed in a very thin dark membrane, much resembling the uveal membrane which sometimes remains in coloboma iridis, or after iridectomy in cases where there has been broad adhesion between the iris and capsule of the lens. Upon examination by means of oblique illumination and the ophthalmoscope this is discovered to be an illusion due probably to the manner in which the light is reflected by the lens. A little above and to the outer side of the centre of the cornea is situated a small circular densely opaque spot about 1‴ in diameter, with a crescentic zone of lighter opacity extending to the inner side of it, almost 1‴ in width at its broadest part. No linear cicatrix is visible. Oblique illumination reveals within the very circumference of the cornea and at about $\frac{1}{2}$‴ from the circumference of the lens as far as can be judged, and apparently extending slightly in front of the circumference of the lens, a circle of small yellowish-brown rounded processes, in all respects resembling the tips of the ciliary processes. I counted fourteen opposite one quarter of the circumference of the cornea. The tension of the eye is normal; it seems elongated in its antero-posterior axis and projects decidedly further forwards than the left eye. Vision is very imperfect. With −5 and a diaphragm (1‴ in diameter) V. = $\frac{13}{200}$. With the diaphragm alone No. $3\frac{1}{2}$ (Snellen) can be read with difficulty at 3 inches. On ophthalmoscopic examination the brilliant red reflection from the interior is observed to be slightly obscured by a small round spot corresponding to the corneal opacity, and by a dark circular line slightly shaded towards the centre indicating the margin of the lens. The outline of the red reflection is serrated, some of the serrations being slightly deeper and broader than others, and corresponding to the intervals between the projecting processes seen by oblique illumination. The refraction is observed to be myopic and irregularly astigmatic. A myopic crescent with irregular outline envelopes the lower and inner side of the optic papilla. The whole of the fundus is very deficient in choroidal pigment. The optic papilla is flat and of a light pink colour, the retinal vessels rather small; the fundus otherwise normal.

I thought this case might be of service in elucidating the effects produced by the local application of atropine and Calabar bean on the ciliary processes and lens. I may briefly summarize the results of frequent applications of both of these substances:—A solution of the sulphate of atropine (four grains to the ounce), frequently applied, apparently produced no decided change either in the ciliary processes or lens. Ten minutes after the application of a drop of a solution of the extract of Calabar bean in glycerine (one minim containing extract corresponding to four grains of the beans), the shaded ring indicating the margin of the lens appeared darker and

broader, and the distance between the margin of the lens and the ciliary processes greater. The effects were most marked. Twenty-five minutes after the application of the Calabar bean the line corresponding to the circumference of the lens being still broader, and the lips of the ciliary processes appeared to project more distinctly and prominently. The patient could read somewhat smaller type held close to his eye than prior to the application.

One point of interest in this case is the nature of the injury which appears to have caused the irideremia. The injury with the knife in early childhood could scarcely have caused such a deformity without the patient's attention having been drawn to it before he was eighteen years of age. On the other hand, the insertion of a finger into the orbit cannot be viewed as an accident likely to give rise to such a condition. I am inclined to believe that a perforating ulcer of the cornea must have existed, with prolapse of iris, and that during some manipulation the whole of the iris must have been drawn out through the ulcer, as in Von Graefe's well-known case.

The man's vision, unfortunately, was very defective, and probably his power of accommodation not so good as in a normal eye. I could not therefore expect such marked effects from the local application of atropine and Calabar bean as might be anticipated in a more healthy eye, but still the changes that were observed after the use of the Calabar bean in the position and prominence of the ciliary processes appear, in my opinion, to corroborate the views of Helmholtz regarding the mechanism of accommodation.

The President then asked Dr. Doyer to describe a similar case which had been under his care.

Dr. Doyer: A student in Leyden came to me to show me his right eye, which was painful. On examining it I saw that there was total absence of the iris, as far as I could judge. On looking still closer, I found a cicatrix on the upper margin of the cornea, and there was an opacity of the lens, which however did not prevent me from seeing well the fundus of the eye. The eye was a little hard to the touch, more tender than it ought to be, and there was a slight excavation of the disc. He could not see well, which I think is to be ascribed to the opacity of the lens. The absence of the iris is very curious. In my opinion the iris must be somewhere in the eye. He had had a wound of the eye when young, but had not suffered very much. Now and then he had had slight pain in the eyeball and also around the eye. The great object was to take away the pain.

I did sclerotomy several times, but it was of no avail. A seton on the temple subsequently succeeded.

The President: I saw the case about ten years ago. He had had a wound or blow upon the eye, but I am sure the iris had not come out of the eye. When the blood disappeared no iris was to be seen. The iris might be somewhere by the side of the lens, but none could be seen. The whole iris can be removed much more easily in man than in animals. Von Graefe once did it on a patient on whom he was performing iridectomy. He thought it better to remove the whole iris. Afterwards, trying to operate on animals, I did not succeed; in rabbits inflammation and suppuration always follow. So that I think the iris may still be detached and remain in the eye. You cannot see in all directions well, and it may be there and yet escape observation.

Dr. Doyer: I could see quite well in all directions.

The President: The lens, however, was slightly opaque.

Dr. Doyer: He could accommodate a little for near objects.

The President: I performed sclerotomy, and he had then for a time a condition of normal tension. The presence of a foreign body explains quite well the attacks of glaucoma. It is in many respects the same as Dr. Robertson's case, and I thought it would be a pleasure to hear an account of it, as I did not remember it distinctly.

Mr. Samelson: I have here a man in whose remaining eye you will find both lens and iris are absent. One other such case has, I have since found, been described by Mr. Dixon. On June 28th the man presented himself at the eye hospital, having been struck the day before on the right eye by a piece of wood. We found rupture of the sclera, prolapse of the membranes, and no perception of light. At the same time the appearance of the left eye attracted our attention, and as it has fallen to me to see a rather large number of cases of congenital aniridia, all of which are mentioned in the *British Medical Journal*, I thought there might be no iris, which was found to be the case. Ten years ago the man had met with precisely the same accident; while chopping wood, a piece struck his left eye, and since that time his sight had been extremely deficient. Under the ophthalmoscope the absence of the iris was obvious, and from the extreme hypermetropia it was surmised that there was no lens. The use of cataract glasses confirmed this view. With a convex No. 3

his acuity of vision is about $\frac{2}{5}$. It is an instance in which a damaged eye becomes useful after a considerable lapse of time.

M. Galezowski: If you will permit me, I should like to make a few remarks in reference to Dr. Robertson's case of irideremia and to your own observations upon it. I have had two remarkable cases of irideremia under my observation, the one consequent upon an operation, the other occurring spontaneously in glaucoma. In 1866 I had under my care a patient suffering from irido-choroiditis consecutive upon a partial adhesion of the iris to the cornea. The patient was scarcely able to count his fingers. I did an iridectomy, and made the incision close to the leucoma, but on seizing the iris it separated from its attachments and came away. I simply cut through the adhesions to the leucoma, and the operation was finished. The hæmorrhage which followed was inconsiderable, and at the end of a fortnight the blood was absorbed and the wound was cicatrized. Under ophthalmoscopic examination the fundus was very distinct; the disk was normal, but there was a posterior staphyloma and no trace of iris. The patient complained of being dazzled for more than four months, but he was able to read No. 3 of the typographic scale with the aid of No. 8 concave spherical and No. 12 cylindrical with axis inclined from the vertical. The second case was equally interesting. It was that of a woman in Mr. Broca's clinic, suffering from acute glaucoma. In this case the iris was separated to a large extent from its attachments above, causing the pupil to be displaced downwards and to be of an oval form. After some days the separation of the iris increased, and it ultimately fell to the bottom of the anterior chamber, when it appeared to be perfectly atrophied. Vision was lost, and the eye remained inflamed, causing protracted pain in spite of well-directed treatment.

Practical Observations on Different Subjects.

By E. Williams, M.D., *of Cincinnati, Ohio.*

ULCUS CORNEÆ SERPENS.

This well known disease of the eye often prevails to some extent epidemically. A series of such cases coming in rapid succession will be followed in a few weeks or months merely by sporadic forms. There is certainly some condition of the atmosphere, perhaps present at such

times, which favours the development of hypopium keratitis and increases its intensity. It usually attacks old and decrepit persons, but particularly those condemned to hard labour and who drink. The characteristic symptoms and fatal tendency of this form of ulceration are known to all. For some years I have been in the habit of using carbolic acid, generally pure, but sometimes diluted, and find it the best local application. It is used from the slightly bulbous end of a very small probe, and confined rigidly to the ulcerated surface. Dipping it *very lightly* into the acid, I touch in succession all the ragged parts of the ulcer, so as to turn them white. If there are little abscesses or yellowish collections, I *bore* them all out by rotating the probe, so as to cause the suppurating and necrotic tissues to slough away and leave a healthy ulcer.

I make the application once a day, till the progress of the ulcer is checked, not neglecting the simultaneous use of atropine to relieve pain and combat the iritis, which always attends this destructive corneal process. Warm applications, systematic pressure, proper tonics, and good diet come in as important aids. Paracentesis often affords great temporary relief from pain, and favours the healing process. It may be practised through the ulcer, or elsewhere. Saemisch's free incision, splitting the ulcer, is still more effectual than simple paracentesis. If there is increased tension it should never be omitted, except, perhaps, in favour of iridectomy. To secure thoroughness and permanency in its effects, the incision should be made freely and the wound sprung once or twice a day for a week or more. I have seldom found it necessary to continue it over two weeks. Tough shreds or clumps of lymph often remain in the chamber after the aqueous is evacuated. They ought always to be removed by the aid of delicate forceps. Since I commenced the practice of free incision my percentage of success has decidedly improved. Even if we can save some sight and relieve the patient of the risks of subsequent staphyloma and its consequences we have gained a great deal.

Iridectomy, if not put off too long, is often successful in saving an eye, but I am not sure that it ought to have the preference over incision. I think the incision should be fairly tried first. The entire removal of the iris according to the fashion of my friend Dr. Bader might be advisable. Certainly in that case the pupil would not be closed with lymph after the operation.

IRITIS.

In obstinate cases of chronic iritis or of irido-cyclitis I have seldom failed to derive great benefit from the systematic use of *warm poultices*. Frequently changed, so as to keep up a uniform temperature and the proper moisture, and continued for a few hours morning and evening,

they aid our other remedies very much. I have sometimes kept up the poultice day and night for three weeks, and been amply rewarded for it. Under its use the pain abates, the pupil dilates, and the iris returns to its natural colour, when before it had resisted everything. Atropine, poultices, and proper constitutional treatment should be faithfully continued, whatever other treatment may be used, and be the disease specific or not.

GRANULATED EYELIDS.

In the States where I practise this miserable disease is extremely common, contributing perhaps more than half the cases of eye disease which we are called on to treat. In large cities it is confined mainly to the poor, and seems to have a special affinity for the Irish. In city people of good circumstances and cleanly habits the disease is rare, and yields much more readily to treatment. Among the farming and mining districts all over the middle, western, and southern States, granulated sore eyes are a genuine scourge, which hangs on for years and leads to endless varieties of disease of the lids and cornea, to say nothing of deeper structures. Having secured foothold in a family, one after another will be attacked, and it will thus remain in the household often from five to ten years.

Although often originating from other causes, the disease is undoubtedly contagious, and spreads mainly by that means. In the country it is by no means confined to the poor, as in cities, but all are attacked alike, because all labour out of doors, equally exposed to the hot sun, rain, dust, cold, and other influences that favour its development and perpetuation. This, with their careless habits, want of cleanliness, and the often democratic use of a common towel, sufficiently accounts for its great prevalence. We have both varieties of the so-called granulations, the papillary and the vesicular, often combined in the same case. The vesicular, the true trachoma of Arlt, is far more frequent in scrofulous subjects, far more chronic and destructive in its course, and exceedingly prone to relapse indefinitely. Without going into the endless and vexed question of its pathology, I simply express my conviction that both kinds of granulations are the result of morbid changes in minute organs naturally existing in the conjunctiva—the papillæ, on the one hand, and the lymph follicles on the other. The papillary form never occurs on the conjunctiva scleroticæ, while the vesicular often does, and even on the cornea. I have not unfrequently seen the latter organ half covered with the peculiar gelatinous, dirty-yellowish deposits that are seen so abundantly in the folds of the conjunctiva. How to account for their presence here the anatomy of the cornea does not explain.

Islets and even large ridges of vesicular granulations are often seen at

the upper and inner cul-de-sac of the conjunctiva, and on the corresponding region of the sclerotic. The latter are most easily brought into view by sliding the lid far upwards and inwards, without everting it, while the patient is required to roll the eye far downwards and outwards.

Of the therapeutics I can only give a few items of personal experience. Never forgetting the leading indication of restoring the affected organ, as far as possible, to a physiological condition, I do not attempt to destroy the granulations directly either by chemical or physical agents. The disease is generally treated too much, while not enough attention is paid to the hygienic management. Pure air, gentle daily exercise, cleanly habits, strict avoidance of all exposure to sources of irritation, reading and close work included, will often lead to recovery without any treatment at all. Too severe or too frequent applications aggravate rather than cure the disease. The inflammatory element that always accompanies granulated lids must first be subdued, and then kept within safe limits; just what those limits are must be learned by experience. In the acute stages, with tendency to, or actual inflammation of the cornea, atropine is invaluable, and perhaps the only local remedy that can be safely used. When this is controlled, topical stimulants to excite gradual absorption come in place. The local use of astringent eye-washes do little good, and sometimes harm. Touching the everted lids with concentrated astringents or caustics, carefully avoiding the cornea, is admitted on all hands to be useful. Of these there are a great variety, each practitioner having usually his favourite routine. In the earlier stages nitrate of silver, in solution or mitigated, is oftener well tolerated than any other remedy. It may be applied with a brush, and thoroughly washed off with water. The acetate of lead in saturated solution, applied in the same way, is a safe and valuable remedy. It will often be tolerated when more severe caustics will excite dangerous reaction. After years of faithful trial, I have lost confidence in the sulphate of copper as a general application. Tannin has the double advantage of being both *harmless and useless.* In the later stages, when the lids are semi-cicatrized with rough patches here and there, separated by forming cicatrices, with a tendency to bleed when rudely touched, I find the local use of chromic acid most valuable. It is used in solutions of from ten to twenty grains to the ounce of water, applied with a delicate brush, and well washed off. In that strength it may be used freely, and allowed to remain some seconds before washing. If it flows over the cornea it does no harm, and sometimes when pannus is present I allow it to do so. It is not followed by much reaction or pain, and often acts admirably in soothing the lids. When the granulations are large, or existing in prominent tufts, I often use it pure, from the end of a probe, confining it strictly to the most

conspicuous ones, and washing off more quickly. This ought not to be done more than once in four or five days, the solutions being used in the intervals once a day.

The pannus and other troubles of the cornea, except when acute and painful, I disregard till the lids are smooth, or nearly so. If they persist, then I dissipate them by strong local astringents. The powdered sulphate of copper, after the manner of our excellent confrère M. Warlomont, is for this purpose the safest and best of all. The mere rubbing the lids with the crystal, or even the cornea itself, does not suffice. The impression must be made stronger. The copper must be scraped down with a knife, and applied freely to the inside of the upper lids, or directly to the cornea. Of course the lid, if everted, is let down quickly, and without washing. Nature's hydraulics will do that sufficiently. By the aid of this, once in two or three days, and other astringents, the cornea may often be cleared up to a surprising degree. I seldom now find it necessary to resort to peritomy or inoculation.

In conclusion, I wish to say that I never treat a case of chronic conjunctivitis, however slight, or of granulated lids, very long without determining the exact state of the patient's refraction under the full effect of atropine. If I find an anomaly I neutralize it with the corresponding glass, tinted if spherical, and make the patient wear it constantly. This often adds greatly to the recovery, and in slight cases may be all that is necessary. It is astonishing how many cases of chronic conjunctivitis are perpetuated by some anomaly of refraction, especially hyperopic forms.

NEURO-PARALYTIC CONJUNCTIVITIS.

For some two years I have had a peculiar case under treatment, which I wish to present to the Congress. An unmarried woman of twenty-five years, tall, delicate, nervous temperament, with a chronic dry cough, and evidences of tubercles in the lungs. Her father had once an apoplectic attack, followed by permanent paralysis of the face on one side. Some three years since the patient began to have attacks of great pain over the malar bone of the left side, attended by some swelling, vivid redness, and extreme sensitiveness to the touch. In some of the paroxysms blood is extravasated under the skin in that region. The attacks last usually from one to three weeks, but become more frequent and last longer, so that now she is never free from some trouble in the cheek, lower lid, and inferior cul-de-sac of the conjunctiva. It now changes from one cheek to the other, but never affects both at once. At its worst the face presents the appearance of purpura hæmorrhagica, and the patient suffers extreme torture. Within the last six months the lower conjunctiva becomes intensely inflamed, swells, and is soon covered by a tough false

membrane, sometimes half a line in thickness, during the paroxysms. If I peel it off in a large flake, with some difficulty, one day, by the next it is reproduced to the same, or even greater extent. The removal of the membrane always causes extreme pain. Lately she has had central hæmorrhages in each retina, with corresponding scotomata in the fields of vision. The disease is probably caused by some irritation at the roots of the fifth nerves, possibly tubercular deposits. I have seen other similar cases, sometimes with hyperæsthesia, and at others with anæsthesia, dilatation of the pupil, paralysis of accommodation, with temporary amblyopia without ophthalmoscopic changes, &c., but never saw such formations of false membranes.

The influence of the trigeminus on the circulation and nutrition of the eye is generally admitted. Recent experiments, aided by the improved tonometer, go far to establish the fact that irritation of the fifth nerve produces active dilatation of the coats of the vessels of the eye, internal and external, increasing filtration into the vitreous, and consequent marked tension of the ball. The sympathetic seems to have the reverse effect, so that the two mutually regulate each other, and thus maintain a normal equilibrium. Eliminating accidental causes, as contraction of the external muscles, the influences which control the tension of the eye are the pressure of the column of blood and the action of these two nerves. As an instance among other published ones of the marked effect of ligation of both carotids on the blood-pressure in the eyes, I refer the members to a case which I published in 1868, which was copied into the "Ophthalmic Hospital Reports," vol. vi. p. 239–40. In the young woman whose case I have just reported above, there was always decidedly increased tension during the paroxysms.

ATROPINE.

The action of atropine on the eye harmonizes with the above theory of the specific functions of the trigeminus and the sympathetic nerves. If it acts specially on the sympathetic, producing contraction of the coats of the blood-vessels, diminishing filtration, and causing softening of the eye, its indications are very numerous and pressing. Adamük asserts that the sudden loss of aqueous under atropine is not nearly so liable to cause hæmorrhage from the iris or other tunics of the eye. The contraction of the pupil under loss of aqueous, from rapid filling of the iris vessels, is not so prompt or so intense. If this be true, as I am inclined to believe, the free action of atropine preparatory to cataract operations is very important. Observations and experiments also go to prove that atropine diminishes filtration through the coats of vessels, and makes what does pass less plastic. In that case it would reduce to a minimum

the risks of hæmorrhage into the eye, plastic exudation, secondary cataract, and closure of the pupil. For these reasons I use it freely both before and after all my cataract operations. Besides its action on the circulation, atropine is invaluable for its effect on the sphincter of the pupil, and the ciliary muscle in iritis, spasm of accommodation, blepharspasm, and numerous other affections of the eye. To secure its prompt and thorough effect, I often use it in substance.

GRAEFE'S CATARACT OPERATION.

Since this operation first became known to me, I have adopted it exclusively in all cases with hard nucleus. In very old or feeble patients it is wise, I think, to confine the entire incision to the sclerotic, but in others I prefer to come out in the cornea. To avoid haggling I enter with the edge of the knife a little forward, and make the whole cut in the same plane. I make the upper incision, a large iridectomy, free discission of the capsule, and then press out the lens in the usual way. In case no iris is left in the angles of the wound, all the cortical substance worked out so as to get a perfectly clear pupil, and perfect coaptation of the incision procured and maintained, healing and success are almost certain. The numerous modifications of the incision proposed do not, I apprehend, affect the results much, when the above conditions are secured. I never give anæsthetics except to excessively nervous patients, or those who refuse to have the operation without.

In one patient, shortly before leaving home, I had a very unusual phenomenon following the extraction in one eye. The patient was a German, sixty-five years of age, with hard cataract in both eyes. I operated first on the left eye, and had a little loss of vitreous following the lens, on account of great prominence of the eye and severe straining. The result, however, was good. Ten days after I extracted the other under chloroform, without the slightest difficulty. For a week the eye was beautiful, and the vision sharp. The eye suddenly reddened and became painful, with œdema of the lids. Still the pupil remained largely dilated and perfectly circular below. A round yellowish mass appeared behind the iris below, seeming to be connected with the corpus ciliare at that point. In the course of three or four days it was as large as a small green pea. After about a week this mass began to diminish and disappeared, leaving the vision again good. It was an abscess of the ciliary below, but why it should have occurred then and there I do not know.

ANOMALIES OF REFRACTION.

With many years' experience in the treatment of large numbers of these cases, I appreciate more and more the value of atropine in their

diagnosis and management. After noting the results of a hasty preliminary examination of the acuteness of vision, the state of the accommodation, the amount (if any) of manifest ametropia, and the condition of the muscles of rotation, I resort at once to the thorough use of atropine, kept up where the results on the refraction are fluctuating for several days, and even in some cases applying it in substance. In that way I at once eliminate the disturbing element, the ciliary muscle, and know the exact nature and degree of the anomaly, if such exists. Should none be found, I abandon that field and seek for the cause in some other. In hyperopia, hyperopic astigmatism, and mixed astigmatism, one can arrive at no positive precision without it, the attempt to do so involving much time and trouble. Even in myopia, especially in the progressive form of young people, there is very frequently a decided spasm of the ciliary, affecting the result and aggravating the disease. In many cases I have found the apparent myopia reduced several numbers by the use of atropine in a few days, and deem the remedy of great value often in checking the progress of the myopia when it is used for weeks or months at least twice a day. As to the numerous tests for astigmatism, I now seldom use any of them but the ophthalmoscope and a complete collection of test glasses, taking for my object the test letters of Snellen. When the accommodation is relaxed you can determine very quickly whether the patient can name certain letters at certain distances or not. The results of all other means have to be controlled at last by the glasses and test types. What the patient wants is relief, and not an array of dazzling radii. The glass or glasses with which he sees best and easiest for far and near are at once the measure of his anomaly and the remedy.

Mr. Soelberg Wells: I wish to know whether Dr. Williams has not made the observation, that in many cases a blennorrhaic state of the lachrymal sac has had a considerable influence on the production of ulcus cornea serpens.

Dr. Williams: That does not correspond to my experience. I have seen a few cases in which the patients suffered from inflammation of the lachrymal sac; but if you do not relieve the cornea before you can check the lachrymal mischief the cornea will be destroyed. I have seen such cases, and the affection is very obstinate and almost always destructive to the eye.

The Ophthalmoscope as an Optometer in Astigmatism.

By John Couper, *Surgeon to the Roy. Lond. Ophth. Hosp., and to the London Hospital, Lecturer on Surgery at the London Hospital.*

The object of this paper is to call attention to certain methods of measuring regular astigmatism by the ophthalmoscope, which are not so commonly used as they deserve to be. I have constantly taught and practised them at Moorfields during the last three years, and have had ample experience of their value. They materially abridge an otherwise tedious process, especially in dealing with patients whose powers of observation are deficient, and in all cases they furnish a reliable objective basis for exactly estimating the asymmetry.

The first step in every such case, of course, is to determine whether astigmatism be present or not, and by means of the ophthalmoscope this is done instantaneously, whilst without it much time may be wasted. Nothing so quickly tires an astigmatic eye, and thereby nullifies an examination, as random trials of cylinder glasses, instituted without previous knowledge of the direction of the chief meridians, and of the true position of the cylinder axis. The ophthalmoscope not only discloses that position directly, as an objective fact—free from errors dependent on the patient—but, at the same time, reveals the kind of refraction in the chief meridians, and likewise supplies data for solving the one remaining question—viz., of the degree of ametropia in each of them. Although it is obviously inexpedient in ordering glasses to trust to the ophthalmoscope alone, unless perhaps when dealing with a young child, or an unlettered foreigner unable to speak the language of his examiner, nevertheless an estimate thus made is exact enough to serve as a guide and as a criterion of the patient's accuracy during the final trials with glasses and test-types, and to detect errors, whether due to want of acumen or to irregular accommodation on his part, or to any other cause.

The well-known observations by Knapp and Schweigger of the opposite elongation produced in the erect and inverted images of the disc by astigmatic media, may fairly be regarded as the first application of the ophthalmoscope as an optometer in astigmatism. It is no doubt true that other characteristics of the astigmatic image were pointed out at an earlier date by Professor Donders and Mr. Bowman. Donders showed that different degrees of accommodation must be exerted in order to bring different portions of the image distinctly into view, but did not in any degree rely on this fact as a measure of astigmatism. Moreover, considerable astigmatism must be present before it is appreciable. So too Mr. Bowman in illuminating the fundus by a mirror, observed the light after leaving the astigmatic media to be more dispersed in one

direction (one chief meridian) than in the opposite, and that by rapidly changing the angle at which the light enters the observed eye (by slight alterations of the plane in which the mirror is held) parallel linear shadows, produced by the unsymmetrical refraction, are seen. This observation is best made when the rays reach the observer so that no definite image of the fundus is seen. Dispersion of light is essential to it, and the greater dispersion in one meridian than in the opposite gives rise to the linear shadows. Only the fact of astigmatism is thus established.

Knapp and Schweigger's method fails altogether for degrees of astigmatism less than $\frac{1}{24}$, and considerable practice in it is necessary to the detection of even $\frac{1}{20}$.

The methods which I propose to discuss are mainly valuable as rendering the detection of $\frac{1}{40}$ and even $\frac{1}{50}$ of asymmetry both easy and certain. High degrees of astigmatism are obvious enough to the ophthalmoscope whatever be the method used. Hitherto, however, the reverse has been true for low degrees—say from $\frac{1}{20}$ downward—which comprise the majority of cases met with. These, as is well known, are not incompatible with normal acuteness of vision, $\frac{20}{20}$, and moreover are associated in certain temperaments with asthenopic troubles out of all proportion to the amount of asymmetry. Under such circumstances the subjective examination is apt to yield a wholly nugatory result, and there is danger that the patient be dismissed with astigmatism and asthenopia unrelieved. It is therefore of the utmost importance to possess in the objective ophthalmoscopic examination a means of checking errors of this sort.

It may perhaps promote clearness in a subject of some intricacy if at the outset I briefly state the facts upon which the two following methods are based :—

The first depends on certain peculiarities in the fundus of an astigmatic eye when examined from a distance of from four to five feet. It may not unnaturally appear doubtful at first sight whether any reliable conclusions can be based on the appearance of an imperfect and circumscribed image thus obtained. Nevertheless, the value of the method in the detection of low degrees of the mixed and simple forms of astigmatism is indubitable.

An extreme distance is required for two purposes—first, to bring the inverted image formed by a slightly myopic meridian within the observer's range of vision; and secondly, to make apparent the direction of the chief meridians by means of the distortion which the image undergoes at that distance. The axis of a cylinder glass can be ascertained by holding it at arm's length, and viewing through it a portion of a straight

line. If the axis coincide with the line, there is no deviation of the image, but if the glass be rotated so that the cylinder axis encloses an angle with the line the image of the latter deviates in the direction of the cylinder axis. I have found that when viewed from a sufficient distance, the same apparent deviation takes place both in the erect and in the inverted image of the retinal vessels.

These two points may be best illustrated by simple myopic astigmatism. Let the meridian of greatest refraction be vertical. If the myopia in that meridian amount to $\frac{1}{36}$, then an inverted image of horizontal vessels forms at a distance of three feet from the eye, and can be readily seen from a distance of three and a half to four feet by illuminating with a mirror of thirty inches focus. All that is visible is a greatly enlarged image of a fragment of vessel or of the periphery of the disc having the direction of the plane of least curvature of the media. Should there be no vessel running precisely in this course the image of one which approaches most nearly to it is distorted and coincides with it. On the other hand, as rays that issue from vertical vessels in the horizontal meridian are parallel after leaving the media, the image of these vessels is in infinite distance and too large to be visible within the area of the pupil. In such a case therefore an inverted image of horizontals only is seen, all other details being invisible, and no erect image is obtained until the examiner brings his eye as close as possible to that of his patient. He then sees only vertical vessels provided he be emmetropic and his own accommodation as well as that of the patient be relaxed.

There can be no simpler method than this for detecting and measuring simple myopic astigmatism. I need hardly here add that by ascertaining the least distance at which the inverted image is distinctly visible while the observer accommodates for his near point the degree of myopia in the meridian of least refraction can be estimated with as much ease and with as much precision as when all meridians are symmetrically myopic. When this has been done the focus of the correcting cylinder, as well as the position of its axis, have been ascertained.

Even without taking pains to ascertain the distance from the observed eye of the inverted image, the degree of myopia in a given plane of the media may be roughly computed from the size and illumination of the image. Degrees of $\frac{1}{40}$ and $\frac{1}{50}$ correspond to large size and faint illumination, *e.g.*, a fragment of vessel the breadth of which considerably exceeds the semi-diameter of the pupil. The smaller and brighter the image the higher the degree of myopia.

In selecting a vessel for this observation it is desirable to avoid those that traverse the floor of the central physiological dimple of the disc. This excavation is sometimes deep enough to give an excessive measure-

ment of the myopia. It is equally desirable to avoid vessels at the periphery of the disc, where the optic nerve fibre layer is thickest. At this point a vessel may lie sufficiently anterior to the plane of the macula to cause the measurement to fall short of the truth.

The aspect of the disc and its vessels when examined at minimum distance as an erect image is strikingly characteristic of the asymmetry in question. Only the vertical portions of the margin of the disc and of the vessels that cross it are distinctly seen. The image of all other portions of the margin and vessels is dim and blurred in proportion as their direction deviates from the vertical. When the chief meridians, two oblique diametral portions of the margin of the disc are distinct the intermediate parts are dim. If the course of a tortuous vessel be followed, only those parts of it which run parallel to the distinct portions of the margin of the disc are well defined, and the appearance closely resembles that produced in certain forms of retinitis when a vessel dips beneath successive patches of turbid œdematous retina. That this latter morbid change does not exist is evident when a concave glass sufficient to correct the meridian of greatest refraction is interposed behind the mirror. All parts of the vessel are then distinctly seen as the observer accommodates for each in succession. The disc thus becomes a valuable test object in astigmatism. When examined by the direct method it discloses at a glance the precise direction of the chief meridians. Finally, by ascertaining the concave spherical glass needed to bring into view that meridian of the image which is placed at a right angle to the meridian of greatest curvature of the media a measure of the astigmatism is obtained from which the correcting cylinder is easily deduced, and since the true position for its axis is already known the whole problem of the correction is solved.

It is hardly necessary to dwell on the practical importance of these facts. At a particular distance vessels are not seen in their true course unless that course happens to lie in the plane of least curvature of the media; and, further, the vessels which are nearly coincident with this plane undergo an apparent deviation towards it, just as the image of a straight line seen through a cylinder glass deviates towards the direction of the cylinder axis. Though the amount of deviation is, in point of fact, short of absolute coincidence with the plane of least curvature, it yet approaches it so closely that no real error arises in deducing the precise direction of the chief meridians in the case where no considerable vessel actually coincides with one of them, and accuracy is further insured by taking the mean of the apparent directions of several vessels which actually diverge in opposite sense from the chief meridian plane. The fact that the image actually does thus deviate is obvious enough in some-

what higher degrees of astigmatism (simple myopic $\frac{1}{14}$ to $\frac{1}{20}$), especially when the chief meridians are oblique (to the extent of 45°). When such a fundus is viewed from a distance of four feet the inverted image discloses a series of very large nearly parallel vascular trunks, running at an angle of 45° with the horizon, giving the impression of an abnormal distribution of the retinal vessels. When the fundus is now examined in the inverted image in the usual way—viz., by means of an eight-inch mirror and a $+2\frac{1}{2}''$ object lens, this error is corrected. The disc, together with the main vessels in the adjacent retina, being all in view, the actual course of the vessels is perceived, no apparent deviation being appreciable by this mode of examination, and the absence of an abnormal arrangement demonstrated. It may even happen that no branch at or near the disc actually coincides with the plane of least curvature of the media, and yet at maximum distance numerous large branches seem to run this course. This appearance results from the distorted image of angular bends in the vessels, the rays from these being dispersed in the meridian of least curvature of the media and brought to a focus in that of maximum curvature produce an image with linear extension in one direction only. In a similar way simple hypermetropic astigmatism is characterized by the fact that an erect image of vessels in one particular direction is alone visible at maximum distance, which in low degrees of asymmetry is considerably less than four feet, inasmuch as the image lies behind the observed eye. As in the previous case, no image is seen in the emmetropic meridian. In simple hypermetropic astigmatism of $\frac{1}{36}$, with the plane of least curvature horizontal, an erect image of large vertical vessels is distinctly seen at from thirty inches to three feet. Of course the nearer the observed eye is approached the more will other large vessels be dimly seen, with a course more and more divergent from the vertical until finally at minimum distance (2″ from nodal point to nodal point) even horizontal vessels, by a scarce appreciable relaxation of the observer's accommodation, become distinct. Of course the accommodation of the patient's eye must also be relaxed during the examination. Even at a point (say one and a half feet) considerably within the utmost distance at which an erect image can be seen in the case supposed, it is not difficult to estimate with accuracy the position of the chief meridians, in spite of the vessels other than vertical which are then dimly visible. The latter are brightly illuminated and well defined; the rest are pale and diffuse, and their faintness increases with their divergence from the vertical. At the same time a maximum distance should always be sought, in order to eliminate from view all vessels except those in one particular direction, which in this case coincides with the plane of greatest curvature of the media. What has been said as to the deviation of the image from the

actual course of the vessels holds as true for hypermetropic as for myopic chief meridians, and accurately indicates their direction in the two simple forms of astigmatism.

It must be admitted, however, that I have not yet succeeded in diagnosing the position of the meridians in low degrees of simple hypermetropic $\frac{1}{40}$ and $\frac{1}{50}$, as readily as in simple myopic astigmatism. One reason is that the former is less common (provided atropine has not been used), and I have hitherto had less experience of it. Another reason probably is that changes of accommodation during the examination are more frequent in the hypermetropic, and necessarily disturb the experiment more than in the myopic case; and this is corroborated by the fact that under atropine the test is as delicate for the one form as for the other. The position of the weakest meridian having been determined, its refraction is measured in the same way and with as much precision as though all meridians were symmetrically hypermetropic. The observer views the fundus at minimum distance (*i.e.*, two inches from nodal point to nodal point), and selecting the finest visible retinal vessel the course of which exactly coincides with the plane of greatest curvature of the media, he ascertains that its image is sharply defined. He then places successive convex spherical glasses behind the sight-hole of the mirror, while his own accommodation, together with that of his patient, is relaxed. The highest + glass through which the image of this particular vessel can be viewed without loss of definition gives the clue to the refraction of the meridian which forms it. The finest vessel should be chosen because a slight loss of definition is detected more readily in its image than in that of a large trunk.

As a preliminary to the examination, the exact degree of translucency of the retinal tissue superjacent to the minute test object should be carefully noted. This precaution should never be omitted, because the nerve substance of the disc and the adjoining portions of retina in eyes with uncorrected astigmatism is often swollen, faintly turbid, and unduly red. Under these conditions a fine deeply seated retinal twig is not seen sharply defined, and the loss of definition due to hazy superjacent retina must be known before that dependent on refraction can be estimated.

For measurements of this sort I have found Mr. Oldham's ophthalmoscope most convenient, on account of the ease and speed with which any desired glass can be placed close behind the sight-hole of the mirror.*

By using the methods just described as applicable to the two simple forms, mixed astigmatism can be detected with the utmost certainty even

* This instrument is described in a paper published in this volume, p. 119.

when the ametropia in each chief meridian does not exceed $\frac{1}{40}$. Both an inverted and an erect image are visible by simply illuminating with a mirror of 30″ focus, and without aid from glasses, according as the retinal vessels are viewed in the myopic or in the hypermetropic plane of the media. The examination is commenced at five feet. Successive portions of the large vessels at and near the disc are brought into the field until an inverted image is perceived of those having the direction of the meridian of least refraction. The observer then approaches the examined eye, and notes the vanishing point of this image. Having thus determined the degree of myopia in one chief meridian, he reduces still further his distance from the patient, and easily brings into view an erect image of vessels running at a right angle to those first seen. They are rendered distinct by an appropriate change in his accommodation. The degree of hypermetropia in the weakest meridian is now measured at minimum distance in the manner already described, and the foci of the correcting cylinders, together with the position of their axes, ascertained with approximate accuracy.

The examination is completed in far less time than is occupied in describing it, and demands no special aptitude on the part of the observer. If at the outset a marked case be selected (*e.g.*, vertical myopia $\frac{1}{20}$, and horizontal hypermetropia $\frac{1}{20}$), and, if atropine be used, both images are seen without any change in the observer's distance from the patient. It is only necessary that he shall accommodate in turn for the distances of the erect and inverted images. He places himself thirty inches from the eye under examination, which is directed to his forefinger held in such a position that the disc is in the field. By slow vertical movements of the finger, followed by those of the examined eye, horizontal vessels sweep through the pupillary field, and are distinctly seen as an inverted image (recognised as such by its reversed apparent movement), provided the observer accommodate for the point ten inches from his eye at which the aërial image is situated. Vertical vessels are next made to pass across the field by causing the eye to follow slow horizontal movements of the finger. The examiner's accommodation being now relaxed (strictly speaking, he must adjust for a distance of rather more than four feet), these vessels are seen as an erect image, with an apparent movement characteristic of it.

I have now to speak of the method of detecting astigmatism by the change of form produced in the inverted image of the disc when the distance of the object lens from the observed eye is varied.

My first observations on this subject were made at Moorfields during the years 1869 and 1870, and communicated to the British Medical Association at their meeting in Newcastle in August, 1870 (vide *Journal*

of the British Medical Association, 1870). At that time I was not aware that M. Giraud-Teulon had anticipated them in a well-known mathematical paper on this subject published in 1869 in the *Annales d'Oculistique.**

The method suggested itself to me while considering an observation made many years ago by my colleague, Mr. Jonathan Hutchinson—viz., that in hypermetropia the inverted image of the disc diminishes, but in myopia, on the contrary, expands in all dimensions as the object lens recedes from the observed eye, and that these two forms of ametropia are thus distinguishable from emmetropia, in which the size of the image of the disc does not vary with the distance of the object lens from the observed eye. It occurred to me that an ametropia, confined to one chief meridian, ought to produce a change of size in the corresponding diameter of the image of the disc, and in that diameter only, as the object lens recedes.

On putting this to the test in the two simple forms of astigmatism, and taking care to select cases with the meridian of greatest refraction vertical in both, the circular outline of the image was in each instance converted into an upright ellipse, but in the myopic case the change was due to a vertical expansion, in the hypermetropic to a horizontal contraction; and although the change of shape was the same for both, they were readily distinguishable by the difference in the size of the ellipse. Nor was it difficult in mixed astigmatism, in which the chief meridians are oppositely ametropic, to appreciate an expansion in one diameter of the image and a contraction in the opposite. I soon became aware that even $\frac{1}{40}$ of asymmetry is disclosed by a very obvious change of shape in the image, and that $\frac{1}{50}$ of astigmatism is not in all instances overlooked, if carefully sought under favourable conditions. In no case are the precision and delicacy of the test more obvious than when considerable hypermetropia or myopia is conjoined to a moderate degree of astigmatism. The great change of size due to the symmetrical deviation, does not mask the concomitant slight change of form, characteristic of astigmatism, the one exception to the generality of this statement being that when myopia has attained an extreme degree, say $\frac{1}{3}$, the inverted image lies too close to the observed eye to admit of the necessary variations in the distance of the object lens. The direction of the change of shape discloses the direction of the meridians; the nature of the change indicates the kind of ametropia.

It is usually unnecessary to dilate the pupil by atropine. With the

* M. Javal has since informed me that M. Giraud-Teulon has simply unfolded in its mathematical relations an observation previously made by M. Javal himself.

object lens placed close to a small pupil, the whole disc is not within the field, but its shape may be discerned by bringing successive portions into view by means of slight lateral and vertical movements of the lens. As the latter recedes, the image of the pupil is magnified in a quicker ratio than that of the disc, and the difficulty disappears. Indistinctness of the anatomical limits of the disc is obviously unfavourable to the detection of small degrees of astigmatism, but even this difficulty is in a great measure counterbalanced by perfect definition of the ophthalmoscopic image. The observer ought therefore to keep the latter at a distance for which he can easily accommodate. The lens must be kept optically centred with the observed media throughout the manœuvre to prevent its acting astigmatically. To effect this the images of the ophthalmoscopic mirror, reflected by the two surfaces of the object lens, should be superposed, so to speak, upon the observed disc, and kept there during the movements of the lens in the line of the observer's axis of vision. The manœuvre is quickly acquired and easily executed. It ought to be habitual—no matter what other objects are proposed in an ophthalmoscopic examination—so that in every case instantaneous information is obtained as to the nature and extent of the ametropia, if any be present. It is convenient to employ a lens of 2″ diameter, and to avoid resting the hand upon the patient's brow.

As regards this test, the anatomical configuration of the disc may be circular, elliptical, or of any conceivable irregularity. The particular form of the image at a given distance of the lens goes for nothing, and a change of size when the distance alters goes for nothing. A change of form is alone significant of asymmetry. The circumstance that the change is produced, under the observer's eye, in an image *continuously* seen explains the fact that considerably smaller degrees of asymmetry are cognizable by this method than by that of Knapp and Schweigger, which is based on a comparison of discontinuous images.

A yet more serious fault in Knapp and Schweigger's test remains to be mentioned. It will be most readily understood from an example—a case of simple myopic astigmatism with meridian of greatest curvature of media, vertical and with the periphery of the disc anatomically circular. This disc viewed directly at minimum distance assumes the form of an upright ellipse. On the other hand, when viewed as an inverted image by means of a $+2\frac{1}{2}''$ object lens it takes the shape of a horizontal ellipse, and the proportion of the long to the short diameter of the ellipse is equal in the two cases. This holds good, however, only so long as the object lens remains close to the observed eye during the indirect examination. If it be withdrawn far enough the inverted image of the disc be-

comes an upright ellipse as in the erect image, and a large amount of astigmatism is wholly overlooked.

From the foregoing it is evident that the method just discussed is available in each of the five forms of astigmatism enumerated in the nomenclature of Donders; while the examination at maximum distance is only applicable to the simple and mixed forms. Theoretically, no doubt, it ought to be of equal service in the compound forms, but it is not so practically. When both chief meridians are myopic, for example, an inverted image is of course seen in each at maximum distance, and as this distance is gradually decreased the image formed in the plane of least refraction, being nearest the observer's eye, disappears sooner than that formed in the plane of greatest refraction, and situated nearest to the eye of the patient. A comparison of the respective distances of these images from the nodal point of the observed eye gives the measure of the astigmatism. The determination of these distances by the ophthalmoscope is both a tedious and a rough process, and is available only for extreme degrees of asymmetry. If the astigmatism be inconsiderable the myopia should first be estimated from the distance of the inverted image from the observed eye when no object lens is used. Subsequently the degree of asymmetry and the position of the chief meridians is gathered from the change of form observed in the image of the disc as the object lens recedes. With a little practice the estimate thus formed comes very near the truth.

When considerable hypermetropia and slight astigmatism co-exist the latter anomaly is first to be estimated, as in the previous case, and then the hypermetropia in the meridian of least refraction may be deduced from the focus of the strongest convex spherical glass through which the erect image continues visible with undiminished definition at minimum distance. These two observations supply the requisite data for a close estimate of the refraction.

If there be as much as $\frac{1}{20}$ to $\frac{1}{16}$ of astigmatism with hypermetropia the refraction of both chief meridians can be readily estimated by noting the strongest convex spherical glass through which the image in each of them can be viewed without loss of definition at minimum distance. When this is done both the astigmatism and the hypermetropia have of course been measured.

M. Javal: A method of detecting astigmatism similar to that last discussed was described by Giraud-Teulon in the year 1869; and a few years before, in Wecker's book, in a foot-note, I stated that the method of varying the distance of the lens gave the most convenient way of diagnosing astigmatism. Since that time I

have never examined a single patient without making the test, and I find that the test is still easier if you take Giraud's binocular ophthalmoscope. The exactness of detection of the astigmatism I found about the same. We can detect about a $\frac{1}{48}$th in that way. I often detected it in examining recruits during the war.

On an Improved Ophthalmoscope.

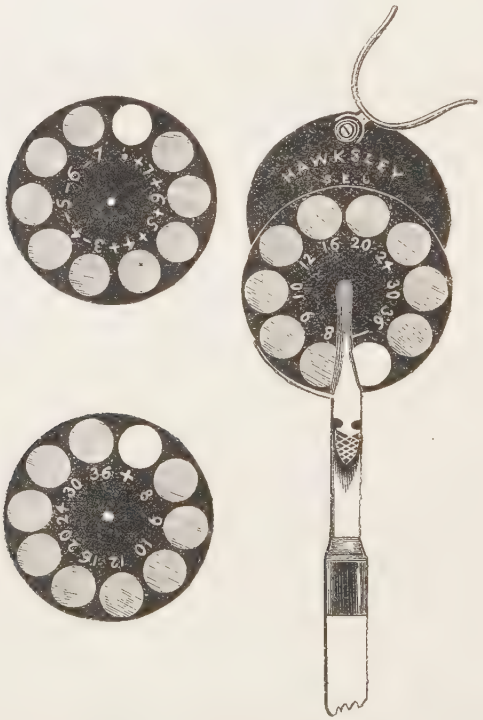
By Charles James Oldham, F.R.C.S., *Assistant Surgeon to the Central London Ophthalmic Hospital.*

In estimating the refraction of the eye by the ophthalmoscope, a course which I almost always adopt in cases of ametropia, before proceeding to try the patient with test-type, I have been greatly inconvenienced by the necessity of removing the instrument from the eye, in order to place those lenses in succession behind the mirror, by which the measure of the faulty refraction could be ascertained. The inconvenience consists in the fact, that it is necessary to carry in the memory a succession of views of the fundus, more or less distinct, until that lens is found which shall give the desired result; and the retention of these images in the mind in their just relation to each other, is in most cases difficult, in many impossible. I have endeavoured to meet this difficulty, and I trust successfully, by the ophthalmoscope I now submit to your notice.

In this instrument the metal back of the mirror has been cut away, and a disc, containing a number of lenses of different focal lengths, revolves on a short central pin fixed in the back of the mirror, thus bringing the correcting lenses in close apposition with the central aperture; while a small rachet, springing from the side of the handle, gives the proper check, as each lens comes before the eye. The means adopted for changing the discs is very simple:—the long arm of a lever of the first order, firmly pressed down on the central pin by a spring placed below its short arm, keeps the disc in its place; by depressing the short arm the long arm is raised, and allows the disc to be changed at pleasure. The discs are three in number, each containing nine lenses of different focal lengths. In two of the discs are respectively fixed convex and concave lenses of the following values in Paris inches—viz., + and − 8, 9, 10, 12, 16, 20, 24, 30, 36; the third contains convex and concave 7, 6, 5, 4, and a convex 3; and in all three a plain aperture is retained. These lenses are sunk on the upper aspect of the disc, to avoid the risk of being scratched during its removal, and are flush with the lower surface, so as to be as close as possible to the back of the mirror.

By the arrangement described above, the surgeon is enabled to turn the disc round without removing the ophthalmoscope from his eye, thus securing the great advantage of an uninterrupted succession of images of the fundus; by this means he computes with ease the exact amount of ametropia in cases either of hypermetropia or myopia: an advantage of especial value in estimating the relative refraction of each meridian in the case of an astigmatic patient.

The mirror, which unscrews from the handle, is about the size of a



pennypiece, and is so flat that it can be easily carried, together with its discs, in an ordinary purse or pocket-book, thus obviating the necessity of a separate case.

I have also had an ophthalmoscope made on the same principle, with one unchangeable disc, containing three convex lenses of the respective values of 30, 20, 10 Paris inches; and four concave lenses—viz., 30, 20, 10, 5 inches focal length, as being the most useful aids in ordinary ophthalmoscopic examination.

Test Types and Acuity of Vision.

By B. Joy Jeffries, M.D., *Boston, U.S.A.*

Visual perception is so much a mental act, that of course all answers from test types have elements of error in relation to the condition of retinal impression. Everything which affects the two elements of sight—namely, retinal impression and mental perception, affects the distinguishing test types.

I have often felt a doubt whether the reading XX at 20 feet in a fair light was a strict enough test. In general we should be satisfied if a patient, after choroiditis or iritis with synechia posterior, read for us XX at 20 feet, and Jäger No. 1 at 10 inches. But this for me would be a reduction of vision to less than one-half. In comparing Dr. Green's with Dr. Snellen's test text, I endeavoured to see how far above normal, or XX at 20 feet, I could go. The following results were from three separate trials, on three several days, when not feeling below par in general sensation of health. My examination of recruits (not drafted men) during the late rebellion, had taught me how much vision might vary in the same individual within a short time, from mental or cerebral causes. The same man who the day after a "spree" could not read my Snellen XL or L, would come back the following day and read XX fluently. Therefore I selected days when the eyes and body were, so to speak, normally used. In testing patients I employ the same Argand gas-burner and partly darken the room. Standing at exactly 20 feet, and avoiding mental and physical interruption—I mean thinking of nothing else—holding the head still, the eyes carefully fixed and not irritated by side light, I succeeded in reading Snellen's XV. H, R, and U were not good letters to distinguish. I read Snellen XII, except S = U. I use the sign of equality to signify that they could not be distinguished from each other. Of Snellen X, I read V, Z, O, U, Y. A and B were bad letters, and P = F, also H = K = R. Snellen's VIII was the lowest I could read any letters of at 20 feet. I read C, L, P, V = Y. If a cataract patient, after operation, read as many letters of XX at 20 feet I should be satisfied.

Of Dr. John Green's new card I read down to X without much difficulty at 20 feet; XVI pretty fluently; XIII, O = C = G. P is bad. Some of the letters of X I could make out, none of VIII. The result, as is seen, was not so good as with Snellen's text.

Out of doors with sunshine on the card and I myself in the shade, I found I could do better.

Snellen's	VIII I could mostly read at 20 feet	} I mean some letters bothered me.
,,	X ,, ,, 23 ,,	
,,	XII ,, ,, 32 ,,	
,,	XV I could fluently read at 32 feet.	
Green's	X at 23 feet.	
,,	XVI at 32 feet, not so easily as Snellen's XV at same distance.	
Snellen's	XX at 53 feet I could decipher.	
,,	XXX at 53 feet I could read easily.	
Green's	XX at 32 feet.	
,,	XXXII fluently at 53 feet.	
,,	XXV just make out at 53 feet. They were confused.	
,,	XX not at all at 53 feet.	

This gives me a varying Vision of $20/_{8}$, $23/_{10}$, $32/_{12}$, $32/_{18}$, + by Snellen's card, and a varying V. of $23/_{10}$, $32/_{16}$, by Green's card. My vision for Snellen's XX and over was from $53/_{30}$ + to $53/_{20}$.

Black letters on a white ground not only looked larger from irradiation, but were more distinctly perceived in detail in daylight. V. = $\frac{53}{20}$. Dr. Green's plain Gothic letters were not so good as the finished letter—I mean L with a top to the perpendicular and upright to the horizontal line, E finished, so to speak, &c.

In reference to my power of visual perception I should say I have not generally found it *much* above *practised* emmetropes, and have regarded my eyes as normal. I have never perfectly paralysed my accommodation to find Hl. I was too busy to test this by total atropine paralysis of the ciliary muscles.

I had purposely avoided being, so to speak, mentally familiar with these letters from their constant presence to the eye in my office. I attempted no record when I had learned them, and could easily detect this familiarity.

Now I would ask, is my vision very much above the average? If not, then these tests are not up to the requisite niceness. I do not mean by this that we are likely to make a gross error of diagnosis or prognosis by their use, but simply would warn against mistakes. These experiments caused a degree of mental irritation as well as ocular fatigue, which will render me more lenient toward my unfortunate patients undergoing the extraction of astigmatism, for instance.

I have not noticed any comments on this communication till the one of M. Giraud-Teulon's in the March and April number of the *Annales d'Oculistique* for 1872. In reviewing the "Transactions" of the Ann. Ophth. Soc. he says I have neglected an important principle of vision in recommending the separation of Dr. Green's test types. Perhaps

he has misunderstood me. What I meant was that *each line* of type should be wider separated from the one above and below, *with which it has nothing to do, and we are not comparing it.* I perfectly understand that the principle of acuity of vision is the determining or separating objects of the same size, distant apart from each other the space of their size. This we have in a line of letters by itself, although it would be still better given by lines of the same sized letters separated the width of their size. M. Giraud-Teulon also thinks I have neglected difference of age. I confess that I should have said that I had not found my V. much better than many practised emmetropes of about my age, then thirty-six years. A slight doubt on his part as to my reported V. has piqued me to again test it when I am three years older—viz., thirty-nine and a half. This is the result out of doors with the tests in bright sunshine, myself in the shade—

I read L, I, T, and J of Dyer's XX at 47 feet = V. = $47/_{20}$
,, L, A, C of Snellen's white or black XX at 47 feet = V. = $47/_{20}$
,, D, T, L, V of Green's XX at 47 feet = V. = $47/_{20}$

I then tested Snellen's coloured XX and my V. was = $38/_{20}$. They are printed on a black ground. The white I could read all of at 38 feet distance. The blue and green were not so good and pretty nearly equal in distinctness. The yellow I could read all of, though not so readily as the white or the black. The red I could read all of. I again found that at the first glance these red letters seemed to stand out the clearest, but in attempting to make out each individual letter it was not so readily done as with the white. They seemed to blur, as from irregular refraction.

In continuation of my experiment, I read—

Snellen	VI	at	$11\frac{1}{2}$	feet = V.	$11\frac{1}{2}/_{6}$
,,	VII	,,	14	,,	$14/_{7}$
,,	I	,,	2	,,	$2/_{1}$
,,	XV	,,	24	,,	$24/_{15}$
,,	XII	,,	20	,,	$20/_{12}$
,,	VIII	,,	17	,,	$17/_{8}$
Green's	XIII	,,	22	,,	$22/_{13}$

This experiment, as I have said, was made with the tests in the bright sun, myself in the shade. The slightest dimming of the sun's light by clouds at once greatly affected my power of vision.

I next tried my V. with Burchardt's Internationale Sehproben. The test for 1600 centimetres or 51′ I did not have space to try, as the yard where I worked was not long enough, being only about 50 odd feet, which

I found no distance at all, and could not at first, judging by sight alone, believe they were intended for 51′.

The dots for 16′ I counted at 29′ = V. = $29/_{16}$

,,	$9\frac{1}{2}'$	,,	17′	,,	$17/_{9\frac{1}{2}}$
,,	$4\frac{3}{4}'$	,,	9′	,,	$9/_{4\frac{3}{4}}$
,,	$3\frac{2}{11}$	,,	7′	,,	$7/_{3\frac{2}{11}}$
,,	23″	,,	48″	,,	$48/_{23}$
,,	19″	,,	36″	,,	$36/_{19\text{-}17\text{-}15}$
,,	17″				
,,	15″				
,,	$13\frac{1}{2}''$	,,	30″	,,	$30/_{13\frac{1}{2}\text{-}12}$
,,	12″				
,,	$11\frac{1}{2}''$	,,	18″	,,	$18/_{11\frac{1}{2}\text{-}10\frac{1}{2}\text{-}9\frac{1}{2}}$
,,	$10\frac{1}{2}''$				
,,	$9\frac{1}{2}''$				
,,	$8\frac{1}{2}''$	,,	12″	,,	$12/_{8\frac{1}{2}\text{ to }6}$
,,	$7\frac{1}{2}''$				
,,	$6\frac{3}{4}''$				
,,	6″				

It will be thus seen that my V. averages $2/_1$, varying from say $36/_{19}$ to $47/_{23}$. It may be I am mistaken as to this being not much above average practised emmetropes of my age, thirty-nine years. I hope others may test their vision also, or that of those within their reach. I should say these experiments of this year were made on one of the hot days of our July, the thermometer indicating 90° Fahr. in the shade where I stood, and the direct sun being hardly bearable. I also was not feeling in perfect health, being fatigued by work and the long spell of intense heat. I speak of these points, because I have found that just such would influence the visual acuity. I again noticed the disagreeable strain of both mental and ocular faculties as three years before, explaining to me many a patient's irritability when undergoing examination.

On a New Binocular Ophthalmoscope.

By V. Schroeders.

Dr. Schroeders stated that Professor Coccius had constructed a binocular ophthalmoscope, which he submitted to his confrères for approval by his hands. The apparatus consists of two parts, of which one is a system of four equal-sided prisms of good flint glass, which are fixed in a small frame of ebony. This prismatic apparatus, since Giraud-Teulon's discovery of the binocular mirror, has been de-

scribed and applied in England, and Professor Coccius therefore lays no claim to its discovery. But in a paper on the Mechanism of Accommodation, written in 1867, he added a + 12 lens in front of the prisms, and thus, in addition to increased simplicity, obtained greater clearness than was practicable with two convex lenses behind the prism and immediately in front of the eyes of the observer.

The introduction of a convex (+ 12) lens immediately behind a concave mirror of 6″ focus with an aperture in it of 3‴ diameter and before the four prisms, enables a larger image to be obtained by the second part of the apparatus.

This second part of the apparatus consists of a small binocular opera-glass, which has a short draw-tube, and in its action is not adapted for distance, but for near objects, so that a distinct and enlarged image is obtained of objects situated at from 16—24 inches distance.

In conjunction with the first named lens (+ 12) this opera-glass gives a still more enlarged image, and with a lens of from 2″ to 3″ focus we obtain an erect image, and thus combine very great enlargement with more perfect clearness and definition than has hitherto been known with the inverted image.

This image is already theoretically distinct in consequence of the enlargement produced by the binocular opera-glass with the + 12 as second objective at a certain distance. If the whole instrument be applied in practice to the dilated pupil the observer is in a position to follow all variations in the circulation of the eyes distinctly, as well as to see the influence of increased respiration upon the blood-pressure, better than heretofore. Also the alterations of the optic nerve in atrophy, the distance of the vessels from the margin of the excavation in glaucoma, the more delicate textural changes in choroiditis disseminata, elevations and depressions in tubercle, &c., all become, owing to the stereoscopic view and the above mentioned enlargement, better seen than by any other means.

N.B. The focussing of the concave mirror must be effected after the opera-glass has been placed in the little frame.

Diphtheric Ophthalmia in Manchester.

By Dr. A. Samelson, *Manchester.*

The doubt expressed by Von Graefe, in his memoir on "Diphtheritic Conjunctivitis," as to whether the morbid condition there first defined be on its occurrence always recognised, and hence dealt with according to its merits, has been echoed by most of those writers who have added to our knowledge of its vicissitudes. However legitimate that doubt must be

admitted to be, the fact appears equally well established that in our day the malady in question has its few favourite and circumscribed haunts, leaving the rest of the world almost entirely untouched. On this head the negative evidence of the trusted observers of London, Vienna, Paris, and Utrecht may be regarded as conclusive.

From the statements even of the most recent writers on the subject, Britain is by common assent held practically to enjoy a thorough immunity from diphtheric ophthalmia.

To show then, if I can, that it is not so, will be the reverse of inopportune, in so far as it will allow me to make tardy amends for what may be called very great remissness on our part. Yet when I here state that Manchester and the districts surrounding it have, now for years past, unfortunately furnished us ample opportunity of observing this frightful and destructive disease, it is not really for the first time that we break silence on the matter. Regularly every year a medical report emanates from the Manchester Eye Hospital. Although it is not a publication in the wider sense of the term, it has for several years past, with more or less regularity, been submitted to the notice of most of the well known ophthalmic writers and practitioners, and especially also of the medical periodical press. The Report for 1867, issued early in 1868, was the first in which diphtheritic conjunctivitis figures in the return of cases of disease, and six is the number of the cases stated to have been observed. Thereafter, whilst 1868 appears to have been a blank, the years 1869, 1870, and 1871 are credited with eight, twenty-one, and ten cases respectively.

Now these numbers may be relied upon so far, though in so far only, as they are within the mark. It is by far the minority of the cases of diphtheric ophthalmia that upon their first admission present the character of this specific disorder, hence they are entered, as the case may be, as phlyctenular or fascicular keratitis, trachoma, blennorrhœa and the like, whilst when the diphtheric seizure overtakes them the diagnosis is but very exceptionally supplemented. For the most part it is only then when such cases are transferred from the out-patients' department to the Diphtheric ward of the hospital, that the corresponding entry "diphtheric ophthalmia" is made in the register of in-patients.

I have as yet not found sufficient time to check the numbers reported for the whole series of five years. I am, however, enabled to make the not unimportant addition of eight cases, all of them, except one, under my own care as in-patients, in the year 1868. The seven cases treated in 1867, and of which six only are noticed in the report, were again my own with the exception of one. Contrariwise, of the nine cases (not eight as in the report) observed in 1869, only a single one was seen and treated

by myself. In 1870 I am credited with four, in 1871 with six cases, whereas in the present year, which by this time already has proved the most fruitful in cases of diphtheric ophthalmia, of the forty-six cases so far recorded thirty have fallen to my share. The first cases this year were noticed as early as in February, but it is particularly since April that the influx of diphtheric cases has been almost continuous. Otherwise, as respects the time of the year, when within our experience the cases are particularly frequent, we also might point to the spring and autumn as the most fruitful seasons, and it is for the first time this year, when the summer has been so uncommonly long in setting in fairly, that the fresh arrivals have been numerous up to the month of July.

As appears then, and I think reliably, from our reports, our diphtheric epoch dates from the year 1867. It is curious to notice that within the first three years of this period, that is, in 1867-68-69, the disorder was found, contrary to the experience of Von Graefe, and more corresponding with that of Jacobson, to affect as a rule persons upwards of eight years of age, amongst whom there was even a man aged forty-eight years, whilst children, and they mostly under two years of age, were seen in but very small numbers; from the year 1870 to this time, however, we have, like others, found the disorder decidedly to prevail among children from two to three years of age. As regards the liability of the sexes it appears from our records that the female sex preponderates over the male in the proportion of five to four, and, whilst within the showing of our own registers in the mass of cases both eyes were affected, among the unilateral cases the right eye was seized oftener than the left in the proportion of nearly two to one.

It is unnecessary for me in this presence to explain what I wish to be understood by the term "diphtheric ophthalmia." Suffice it to say that it is not the so-called membranous conjunctivitis as characterized by the formation of a pellicular and easily removable recurrent exudation on the surface of a mostly highly vascular mucosa. A few instances of that form of conjunctivitis (not my own cases) appear indeed in our reports for former years to have been mixed up with the case of true ocular diphtheria. But here I am concerned with the latter alone—*i.e.*, with that specific affection of the eye, for the life-like delineation of which we are indebted to Von Graefe (in the 1st vol. of the *Archiv für Ophthalmologie*),* and the chief pathognomonic feature of which is the thorough solid infiltration of the parenchyma of the mucous membrane, so almost hopelessly unmanageable and so prone to destruction.

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* See translation in the *London Medical Review* for 1860.

Without entering into much detail I may, therefore, briefly state what have been in our local experience the main points now of difference from, now of agreement with, the observations of Von Graefe and of his followers, especially Jacobson, Mooren and Hirschberg.

It is evident from the repeatedly observed accumulation of cases within a short space of time, that we at Manchester also may point to the occasional epidemic occurrence of the disease, with its marked modifying influence upon the contemporaneously occurring cases of the ordinary forms of conjunctivitis. From what we have so far seen, however, we would scarcely be justified in assigning a systemic origin or diathetic character to the affection of the eye, but must rather view it as a local disorder. Also do we but most exceptionally meet with any of those concurrent symptoms of diphtheria, as stomatitis, rhinitis, croup of the larynx or pharynx, or diphtheritic seizures of raw surfaces with which the eye affection has elsewhere often been found to associate itself. It is true that in a number of cases, although not a very large one, we meet with the disease in question in very puny children, the subjects of congenital syphilis. The most frequent forerunners of the diphtheritic affection which we but rarely meet with as having seized a previously quite healthy eye, are also with us phlyctenular keratitis, pannus, blennorrhœa, and the like. Again, I also have to record two cases, one of them fatal to the affected eye, coming on after tenotomy, and one equally destructive in an eye from under the conjunctiva of which I had shortly before removed a tumour. At an early part of our diphtheric epoch I had more frequent opportunity than since of witnessing that idiopathic seizure of the cornea, evidently not due to propagation of the process from the conjunctiva, which Jacobson was the first to insist upon, and which Von Graefe himself has later likewise admitted.* The superficial coherent fibrinous membranes which the latter describes, and which I remember seeing him withdraw in large flakes with forceps, are scarcely observed in our own locality. That the eye becoming secondarily affected is the one that suffers more gravely has frequently been verified.

As to the origination of diphtheric seizures, it appears that during the epidemic prevalence of the disorder, even the guarded application of the caustic to a granular lid, or in cases of blennorrhœa, may prove sufficient in predisposed individuals to light up a diphtheric attack. But it has not yet fallen to my lot, among the large number of cases of burn with lime or other caustic substances which fall under our notice, to see even a single one giving rise to diphtheric infiltration. Gonorrhœal

* See my "Supplementary Article on Diphth. Inflammation of the Eye," in the *London Medical Review*, 1861, p. 45.

ophthalmia, which recent teaching tends to identify with the diphtheric malady, appears with us to be an occurrence of extreme rarity.

The opportunity of noticing, in cases of blennorrhœa neonatorum, a transitory stage of diphtheric inflammation, has just again been recently afforded in a number of cases, whereas, I can scarcely call to mind a single instance of genuine diphtheric ophthalmia in so young an infant. The pannous condition of the cornea, although, generally speaking, I have, like others, often enough noticed it to enable the eye to pass comparatively unscathed though a severe diphtheric seizure, was yet not found invariably to prevent the organ from suffering serious damage. Of recrudescence of the diphtheric infiltration such as Von Graefe has made us acquainted with, I have seen next to nothing, but the solitary case I had to deal with in 1869 was one of recurrence, destructive to the eye, in a girl twelve years of age, who had, *two years* before, after the most fearful suffering, had a most unexpected escape. Of the utter loss of both eyes through diphtheric conjunctivitis, I have, amongst patients of from two to three years of age and upwards, observed one instance only, and that in a sense a mitigated one. The case was the one I previously mentioned, of a man forty-eight years of age, the subject of very advanced atrophy of the optic nerves, who having as usual attended as an out-patient at the hospital, returned thither four days after with both eyes already in a most unpromising state, both corneæ being diffusely infiltrated, and encircled by tense chemosis: the most fulminant case I have ever noticed in my own practice. In harmony with Von Graefe's recorded experience, the percentage of bilateral losses was, in my own, considerably greater among children than among grown-up persons.

On the whole, I am inclined to rank our cases in severity between those of Von Graefe and those of Mooren, who well qualified as he is to institute the comparison, expressly testifies to the much less gravity of his own cases. Although I have never found it necessary, in my remembrance, to resort to the use of chloroform merely to facilitate the examination of the eyes of sufferers from this extremely painful disease, I am far from maintaining that it might not sometimes have been as well to do so.

In reference to my observation of the course of the disorder it only remains for me to state that the period of cicatrization of the mucous membrane, the often so baneful third stage of Von Graefe, is with us scarcely ever observed to entail any considerable harm. I have but recently been able to verify this by purposely examining a pretty considerable number of eyes, which I had seen at the time passing through a most severe ordeal. But more frequently than before have I of late been able to notice a very pronounced granular condition of the palpebral

mucosa to spring up in the blennorrhœal stage, and to persist long after the storm of the attack has passed.

It is well known that every one of those who, after Von Graefe, have published on the subject, have been able to record some discrepancies between his and their own experience; but these so far from invalidating his teaching are admitted only to bear him out in his earnest caution to beware of a hard and fast ontological conception of the disorder.

In the treatment of the malady there is obviously plenty of scope for an individualizing course. As the intensity and the phenomena of the affection have differed in the respective localities, so our approved observers vary in their appreciation of those remedial measures in which any confidence is placed. Limited in number as these are, they are readily mustered. With us an almost total abstention from the use of caustics appears to occupy the most prominent part. I scarcely ever dared to try my hand at those probatory cauterizations so guardedly allowed by Von Graefe. The constant use of the iced compresses during the height of the attack, has always been my sheet anchor; for the substitution of warm applications so earnestly recommended by Mooren, I have seen but little occasion; mercury, leeches, and the protective bandage, are admitted to be seriously applicable only in the cases of adults. I have seen very decided results from the employment of the mercurial ointment in the way recommended by Mr. Teale for the treatment of iritis, and have had reason to be satisfied with the effect of from half-a-dozen to a dozen of leeches. I am, however, fully aware that, as emergencies might demand it, the orthodox plan of a far more energetic resort to mercury as well as local bleeding must by no means be lost sight of. Of the real advantage of a properly managed protective, or, as it is called, hermetic bandage, I have no personal experience; I can only say, speaking of course of the cases of adults, that in one set of cases it was too late for one of the two eyes to be kept entirely out of harm's way, and that in another the disease has in the absence of such precaution remained limited to one eye. For those deep incisions of the tensely infiltrated mucosa so useful in Jacobson's hands I have never seen the remotest scope nor ever felt the courage, neither can I say much in favour of the recommended division of the external fibres of the orbicularis muscle. As to paracentesis of the anterior chamber at the sclero-corneal junction, found by Jacobson so universally applicable at the time, I have either not felt induced ever to give it a trial, or may have been forgetful of his advice at times when it might have been applicable.

It is a question as to whether children affected by diphtheric ophthalmia should be treated as out-patients, or in the hospital-ward; whenever domestic circumstances admit of a choice, I am from recent experience inclined to think that they had better be treated as out-patients.

Traumatic Aniridia and Aphakia.

By Dr. A. Samelson, *Manchester*.

Dr. Samelson showed a case of total absence of the iris and lens in the left eye of an Irish labourer (John Kelly), sixty-six years of age.

Whilst chopping wood on June 28th last, he received a blow by a piece of the timber on his right eye. When he presented himself, the day after, at the Manchester Royal Eye Hospital, the sclerotic was found to have been ruptured all round the inner limbus of the cornea; the membranes were protruding; there was hæmophthalmus, and the perception of light was extinct.

Eleven years before, the *left* eye had, under quite similar circumstances, likewise been struck by a piece of wood, and, on that occasion, the nature and direction of the blow must have been such as to cause the escape of the lens and the iris from the eye. A narrow greyish line of about a third of an inch in length, just above the limbus corneæ, marks the place where the rupture of the sclera must have occurred. The whole corneal area of the eye presents an aspect of unrelieved dullish blackness. In the situation of the lower ciliary margin of the iris, there is a faint trace of a serrated darkish seam, apparently a memento of the iris. Of the ciliary processes no vestige can be discovered. The ophthalmoscope shows the optic papilla of somewhat deadly white appearance, the retinal vessels much attenuated, a very scanty provision of choroidal pigment, and at the same time, the existence of extreme hypermetropia. The catoptric test confirms the absence of the lens. The observer's unassisted eye, following the rays of the candlelight almost in their own direction into the iris and lensless space, perceives with great distinctness the optic disc, the retinal vessels, the whole detail of the fundus. The patient, with + 2, reads No. 1 Jaeger, whilst his acuity of vision with + 3 is $\frac{2}{5}$. The field of vision is normal, and of very considerable extent. Provided with reversible broad-rimmed lenses of about four lines diameter, and respectively two and three inches focus, the patient, thanks to the reinstatement of his left eye, is not very much the worse for the loss of the right.

Mr. Dixon, according to his reference in Holmes's "System of Surgery," appears to have observed two cases of a similar nature, the first of which, as recorded in the first edition of his "Diseases of the Eye," seems to have been very much like the one here described.

A New Means of Measuring the Distance from the Cornea to the Posterior Surface of the Lens.

By W. Gama Lobo, *of Rio Janeiro.*

Up to this day the distance from the cornea to the posterior surface of the lens has been measured by employing the ophthalmometer, and by using a gas or petroleum light. With such lights it is very difficult to obtain a good measurement because the image of the posterior surface of the lens is very pale.

I will present to you a new method, by which it is far easier to obtain a better result by sunlight.

A dark room is required, having a window with two fissures through which the rays of sunlight may enter. Close to the window a table is placed with the board or top divided into centimetres, having zero in the centre. Perpendicular to zero at a distance of 15·7 centimetres a mask is placed that will support the chin of the person to be observed. The point of view is placed agreeably with the following formula, $X = \tan. a\ D$. (D is the distance between zero and the mask.) a represents the angle of the ophthalmologists, which in this case was 5° 45″, which gave us a distance of zero 15·7. This point is indicated by a light which is placed behind a red glass.

The light of the sun is received by the heliostat, which reflects it through a lens by the opening or fissure in the window on to the cornea. In the dark room it passes through a hole made in a piece of pasteboard.

Let d be the luminous rays at a distance of thirty-six centimetres from zero. The ophthalmometer must likewise be placed at the same distance on the opposite side d'. The point of fixation is already known as 15·7. The light is brought from the end of the table in the direction of zero until its image is placed behind that of the posterior surface of the lens, when the number of the centimetres marked by the light is to be observed, after which the ophthalmometer is to be placed at d, and the luminous rays must pass through the other opening or fissure in the window, which up to this moment has been closed, the heliostat being then for this purpose placed in the direction of the opening or fissure, the point of fixation remaining unaltered, and the light is then employed in the same way as when the ophthalmometer was on the opposite side, as before described.

There are two distances to be known.

First. The distance from the axis of the cornea to the visual ray, which we shall denominate y.

Second. The distance from the cornea to the posterior surface of the lens, x.

The first formula $y = \frac{\rho}{4}$ tan. a'—tan. a''

The second ,, $x = \frac{\rho}{4} + \frac{\rho}{4}\left(\frac{\text{tan. } a' + \text{tan. } a''}{\text{tan. } w.}\right)$

$a' = A' - a.$

$a' = A'' + a.$

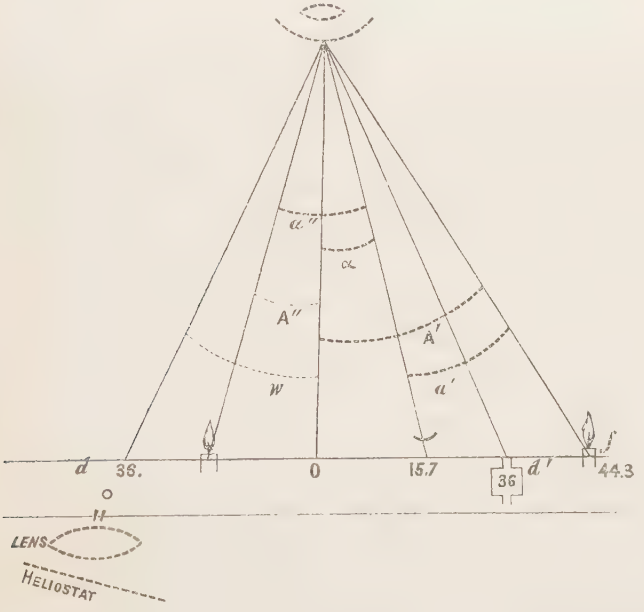
ρ is the anterior curvature ray of the cornea.

$y = 0{\cdot}0678.$

$x = 7{\cdot}38.$

The true distance from the cornea to the anterior surface of the lens is 3·473. The thickness of the lens is 3·907.

The idea of employing the rays of the sun was suggested to me by Professor Helmholtz.



On the Relative Frequency of Various Ophthalmic Affections.

By Dr. Noyes.

It has been my practice to have a printed scheme by which I might make a full investigation into all the elements of sight, so as to arrive at the defective condition. I propose to make a brief statement of the facts which have come under my own observation in a single year. In that time, in private practice, I have observed only eighty cases of muscular troubles, simple and uncomplicated. Of these I have found insufficiency

of the recti interni without any error of refraction and with normal sight, 11 ; I have found insufficiency of the recti externi, without error of refraction, 4 ; of recti superiores, 1 ; of superior oblique, 1 ; of all muscles, 1 ; insufficiency of recti interni complicated with myopia, 21 ; of interni with hypermetropia, 10 ; of recti interni and defective accommodation in persons young or presbyopic, 10 ; insufficiency of recti externi and myopia, 3 ; of externi and astigmatism, 1 ; of all muscles and myopia, 1 ; of nystagmus with myopic astigmatism, 1 ; nyctalopia (?) 80. I have left out the cases of simple astigmatism, of which I have found 34. Hypermetropia without muscular complication amounting to 13. Myopia I leave out of account.

So while simple astigmatism forms the largest proportion of the whole number, the next in the category is insufficiency of the recti interni with myopia; then insufficiency of the recti interni with refractive error; then comes astigmatism with insufficiency of the recti interni.

A large part of the above patients were females, and most of them were in defective health, some complaining of one, others of another affection. In all cases it has been my aim to correct optically the visual defect by prismatic glasses, and at the same time to combine with simple prisms the corresponding refracting surfaces needed, cylinder, spherical surfaces, or both. I have had some remarkable instances of the tolerance of prismatic glasses. One medical gentleman has worn for seven years a pair of plane prisms with bases inwards whose total is 14°. The general condition of these patients always requires treatment, and when nervous and debilitated the use of diluted phosphoric acid with or without strychnia has been beneficial. The accompanying symptoms have been pain, located not invariably over the region of the affected muscle, but often circumorbital though well-defined. I have likewise made use of the galvanic battery in these cases to improve the muscular condition, and in a few instances have succeeded by prismatic measurement in discovering a substantial advance, and in other cases an improvement in the sensations of the individuals. Nevertheless I am sorry to admit that the galvanic battery has not much improved the muscular power, but it has lessened the pain. In these cases there is often a large amount of conjunctival irritation, and in some instances the pain they suffer is not confined to the period when they use their eyes. I should like to call attention to one or two special cases.

One is a case in which all the muscles of the eye were at fault. The patient was a young lady in ill-health, in whom there was insufficiency of the interni and externi, and vertical diplopia could easily be induced. I failed in every possible contrivance I could think of to improve her. She suffered pain constantly. No prismatic glasses would afford relief,

nor would general remedies. It was manifestly a case for surgical operation, and in that case I felt that the resources of ophthalmology, so far as I could apply them, were quite useless.

I would like also to call attention to some peculiar conditions which I have observed in persons having insufficiency of the recti interni with myopia. In a few cases I have performed tenotomy of the externus, and, having been careful in the selection of such cases, have had, in most instances, a satisfactory degree of improvement. But there have come under my notice in the course of a few years perhaps half a dozen individuals who presented, on first examination, a most striking picture of intense photophobia and nothing else; their heads were covered up, or else they were kept in a dark room. These individuals could not be persuaded to submit their eyes to inspection till very considerable effort had been used, and in some cases it was necessary to place them under the influence of chloroform. I have found in these cases that the trouble at the bottom of all was an insufficiency of the recti interni, with or without myopia; in one case with hypermetropia; in another with myopia. Some of these cases were readily relieved, in the first place, by moral suasion, assuring them that they would not be blind; and, in the second place, by the appropriate use of prismatic and refracting glasses.

Such are some isolated clinical facts which I desire to present to your attention, and trust they may not be without practical utility.

M. Donders: I have to ask the meeting whether ladies shall be admitted to the banquet at the Crystal Palace to-morrow? I see it is an acceptable proposition. In order that we may get through our work it is necessary that we should prolong the hours of meeting till six o'clock. As it will be impossible to devote much time to discussion, I trust that only very important observations may be advanced.

Saturday, August 3.—Morning Sitting.

M. DONDERS IN THE CHAIR.

On Intra-orbital Dermoid Cysts.

By W. Spencer Watson, F.R.C.S. Eng., and B.M. Lond.

Three cases of dermoid cyst within the orbit have come under my notice during the last few years. The first occurred in the practice of my friend and colleague, Mr. J. Sebastian Wilkinson. The patient was a woman, æt. forty-nine years, the mother of a family, in delicate health, whose right orbit was affected with a tumour causing protrusion and displacement inwards of the eyeball and considerable impairment of sight with diplopia.

Thirty years before she had observed some discharge from an opening at the outer side of the orbit, and for some years past had noticed "a lump at the back of her eye," but without protrusion of the globe. Some months back, however, she received a blow in the eye, which caused a great deal of swelling, involving the whole of the right side of the head; and ever since the eyeball has been displaced, her sight has been much impaired, and she has suffered from severe pains in the head.

In June, 1868, when I first had an opportunity of seeing the patient, she had a nodular swelling of the size of a filbert, divided along the middle by a firm fibrous band, situated at the outer part of the right orbit. There was distinct fluctuation in this swelling. With her right eye she could only distinguish letters of Jaeger No. 17; with the left, letters of Jaeger No. 12. Mr. Wilkinson made a puncture into the tumour from its conjunctival aspect, and let out some atheromatous opaque yellow fluid in which were entangled a few hairs.

This made the diagnosis unmistakable. On June 18th the tumour was laid open from the conjunctival aspect, and a quantity of cheesy semi-fluid material with a few hairs escaped. The cyst was syringed out with water, a portion of the cyst wall taken away, and the cavity stuffed with lint.

Within a few days, suppuration of the cyst having been established, the lint was removed, and shortly afterwards the cavity contracted, and

the eyeball receded gradually, leaving a sinus which discharged for some time afterwards.

Remarks.—The history of this case makes it clear that the cyst was of the true dermoid character, that it remained comparatively harmless for many years until the date of the injury; increased action and perhaps suppuration was set up by the blow, and the eyeball was protruded and inverted; the depth and large size of the cyst-wall and the sequelæ of the accompanying inflammation made it difficult and even hazardous to attempt to remove the whole of the cyst, and hence the treatment adopted was the best under the circumstances that could have been employed.

I have recently had a case under my care in some respects similar to this.

A boy, æt. twelve years, was brought by his mother with the right upper eyelid and orbital tissues enormously swollen and inflamed, the eyeball being protruded and thrust downwards and inwards. There was no history of any injury, but his mother had noticed ever since his birth a minute orifice near the centre of the outer third of his upper eyelid, from which a thin serous discharge exuded from time to time. On examining this spot I found an opening admitting a small probe to the depth of $\frac{1}{8}$ inch, and projecting from it three or four hairs like those of the eyebrows. There was then no discharge and the sinus appeared to be a mere cul-de-sac.

The boy being in a high state of fever and in considerable pain, I made an incision into the swelling through the eyelid at this spot, and let out about half a drachm of thin pus. This gave great relief. The swelling subsided, and the eyeball soon regained its normal position. Diplopia had been observed, but this soon disappeared after the opening of the abscess. A circumscribed hard nodular swelling remained in the position of the abscess, and on a subsequent occasion the cyst was dissected out. It proved to be thick walled, with a small contracted cavity, the lining of which was smooth and mucoid, and covered by minute hairs. The wound made in this operation healed quickly, and the lad had no further trouble.

Remarks.—This case resembles the first in the circumstance that the presence of the cyst gave rise to no inconvenience until an accidental inflammation was set up in and around it. It points, however, to the advisability of removing such a cyst before any similar accident can arise, and the difficulty experienced in dissecting it out from the matted and indurated cellular tissue of the orbit is an additional argument in the same direction.

Mr. Taylor had a case of the same kind in the Central London Ophthalmic Hospital in the year 1870, in which he operated with great success in the early stage of the disease and before any inflammatory thickening

had occurred. The patient, a lad thirteen years of age, had a tumour in the left orbit. The only inconvenience caused by it was the displacement of the eyeball downwards and outwards, and the consequent diplopia. By a careful dissection the cyst was completely removed, and a good recovery without deformity resulted.

Remarks.—From a consideration of these and similar cases it may be presumed that the dermoid cysts which we see so commonly in young children on the *margin* of the orbit may, under certain circumstances, make their way *into the cavity*, though I am not aware that such a sequence of events has ever been traced in an individual instance.

I have, however, on more than one occasion observed the margin of the bone deeply indented and hollowed out under the cyst, as if its constant growth and continually increasing pressure had caused absorption of the bone beneath it; and if such a process is going on, while the aperture of the orbit is continually expanding (as in a growing child is always the case), it is obvious that a tumour which was at first *external* may ultimately become *internal* in its relation to the orbital walls.

If I am not mistaken, there are cases on record in which the bones of the skull have been actually *perforated* by the absorptive influence of steatomatous tumours of the scalp; and I believe that a similar absorption of the margin of the orbit may, in certain instances, permit these dermoid cysts to descend, as it were, through a trap-door into the orbital cavity, though I conceive that this change of position is more commonly effected in the manner above indicated; and it is no doubt possible that in some cases the cyst has been intra-orbital from its commencement.

M. Warlomont: All the arrangements of this Congress have been so well made that I should be sorry to suggest any alteration, but I have ascertained that the President has a communication to make presently, and I would ask whether the Congress desires that he should speak. (Applause.)

On Section of the Cornea as a Preliminary Operation.

By J. F. Streatfeild.

There are two instruments in common use which I never employ, and, as it seems to me that they are not only unnecessary, but also disadvantageous, I wish to unburden my mind in a matter which to most operators I have no doubt appears to be a mere eccentricity in my practice; as an apology for myself and by way of ventilating the matter so that it may be seen if my reasons are well founded, I allude to the lance knife and the long narrow knife now used in extraction of cataract.

Some years' practice in operating, and without the two instruments in question, leave me no room to doubt but that I shall never use them any more. I do not think, whatever they may be in the hands of other operators, that they can ever be for me better than the instrument which I always use instead of either of them. But if theoretically either or both of these instruments can be proved to be better for their purposes than my own knife, I will begin again to make practical use of it, or of them, and to try them once more. *I have no peculiar instrument*, and when I say "my own knife," I mean only such a knife as I generally use. It must have just sufficient strength and stiffness not to be liable to bend; it must have a sharp point to enter the cornea easily, and a single sharp cutting edge to incise it. I find all these combined in a knife that was generally used in the latter days of the old semicircular flap extractions—Sichel's knife. This knife I therefore generally use when I have to open the anterior chamber. Indeed, I *always* use it unless I require only so small an opening as can be made by the direct puncture of a broad needle. If I have to make a larger opening, to make an incision in the cornea (however small a section may be required), I very much prefer Sichel's knife (or any other having such qualifications), in any of the modern operations requiring a preliminary section of the cornea, to any of the instruments generally used for the purpose in these operations. Especially do I believe it to be very superior to the lance knife in iridectomies, or to the long narrow knife in extraction of cataract. In either of these operations, as I have said, I use Sichel's knife. In extracting cataract, however, I never make a counter-puncture. The eye must be perfectly well fixed, and secured with speculum and forceps. The patient is inert by anæsthesia, I then enter the point of the knife at either extremity of the section I intend to make, *at such inclination to the surface* (*I mean more or less perpendicularly*) *as may seem desirable.* In this way I can direct the knife to the centre, whether of the anterior chamber, of the pupil, or even of the eye itself, in any case. I pass it on into the anterior chamber more or less until the point is near the iris, and then it is turned outwards, away from the iris towards that part of the cornea I am about to cut through, and, *holding the knife firmly, maintaining the same inclination*, and pressing it onwards in the direction it is to take (with a slight sawing movement if necessary), it is advanced more and more, and very steadily, in the direction and to the limit I have assigned to it beforehand. *I never allow the point of the knife to transgress the pupil* at any time or stage of the proceedings or under any circumstances, but keep it always in the circumference of the anterior chamber, always in view between the cornea and iris, and in front of the latter. The sweeping section need not be very quickly

made, nor should it be made very slowly, as the aqueous humour begins to escape as soon as the knife is made to glide onwards after the point has been turned away from the centre and is skirting the anterior chamber. But there is plenty of time to complete the longest section. Sometimes the knife can be run round the margin of the cornea in the assigned direction as easily as a curved line may be drawn on the black-board. The end of the section is made in one of two ways, both *practically* alike. I either bring the knife, as I am withdrawing it, gradually into the position, radiating from the centre, in which it was entered, or I make the point of the knife, turned from the centre, cut its way out suddenly (see Fig. 3). In either way *this extremity of the incision is made as square to the surface and in the same direction, radiating from the centre, as that made at first*, when the knife is entered. Let me compare this fairly with the use of the two instruments I have given up.

1. *The lance knife: iridectomy.—a.* It does not cut well, the point is so obtuse. *b.* It must be made to transgress the pupil and (in glaucoma especially) the lens is dangerously near. *c.* It *must* divide the cornea very obliquely, for, if the thrust were made at all perpendicularly to the surface, the lens would certainly be wounded. So that, *d.* It cannot make an opening close internally to the greater circumference of the iris. *e.* It can only make an incision all in one plane.

2. *Von Graefe's knife: cataract extraction.—a.* It makes the end of the incision at which the counter-puncture is made very (deceptively) large externally and small internally. It would not be so, of course, if the old *semicircular* section were made, but of anything less than this it is true, and the smaller the segment of the circle included in the section, the smaller is the comparative size of the opening made internally as compared with its *external* dimensions. This inner and smaller dimension of the corneal opening is the only one practically available. *b.* It must divide the cornea very obliquely as it passes through it, or the knife could not reach the point of counter-puncture. And when the counter-puncture is made, its course is no longer free. It must continue in the same course as the incision is being completed. For the corneal opening to be large enough in the counter-puncture way of incision, it must be made much larger externally than it need be. And moreover it does not lead so directly to the cataract as when the incision is made (as in my way) more perpendicularly to the surface, more backwards, more towards the centre of the pupil. I am aware that Von Graefe's incision was *not* made wholly in the cornea, then of course it would not be so very oblique; but incisions into the anterior chamber should be, I believe, made only and wholly in the cornea, so I have not considered the other case.

In the way I have for many years adopted and beg now to recommend—

a. The corneal opening is not contracted in size internally. *b.* The two extremities of the corneal incision are both square (in lines radiating from the centre), admitting thereby more easily the exit of a cataractous lens by the larger opening thus made. *c.* The whole extent of the incision is inclined to the surface, more or less perpendicularly, and directed backwards and to the centre (of the eyeball) as much as may be desired in any case. Thus, for instance, the greater circumference of the iris, in glaucoma, is reached. *d.* The line of the incision may be curved, not only as the outline of the cornea is curved, but the incision need not be all in one plane. *e.* The lens cannot be wounded.

With a lance knife a straight thrust is made into the eye, and for practical purposes, as far as concerns the corneal opening that is made, all in one plane. With the long narrow knife it is an equally straight thrust, and for practical purposes it is also all in one plane, but the incision is completed by cutting outwards. There can be no inclinations, varying more or less from the perpendicular, in the surfaces of the incision, however desirable, or any curves or change of plane in its course.

In making corneal incisions, I am always anxious that they should be ample and entirely corneal. As I would never let the knife transgress the pupil, so would I never pass with it beyond the cornea into the sclerotic, or very near it, into the vascular and nervous parts thereabouts. If the incisions have extended into the sclerotic, we often see—*a.* The wound, I think, heals less readily, and then—*b.* The eye is intolerant of light. *c.* There is ciliary redness, and the eye is irritable and liable to blush at any time. *d.* There is often lachrymation. *e.* And not improbably some slight chronic iritis. *f.* Which is recurrent or often aggravated. *g.* The globe, in the worst results, wastes finally. *h.* And sympathetic irritation of the other eye is a not improbable contingency.

The operation I have described is easy inasmuch as it may be carried out on either eye with the instrument in the right or left hand. But generally speaking, no doubt it is rather difficult at first to make the movement of the hand, as in free-hand drawing, which requires some little practice. The most important point is that the line of incision, its extent and inclination, be well marked out in the mind's eye before it is begun. No doubt in amputating a limb it is easier to transfix and cut outwards than, in cutting inwards, to describe the outlines of the flaps. The case has little resemblance to section of the cornea, but I would not choose the former method if the exact shape and size and extent of the flaps were very important, in any case.

The great advantages of my section of the cornea are, I believe, 1st. That both extremities of the incision are square and an opening is

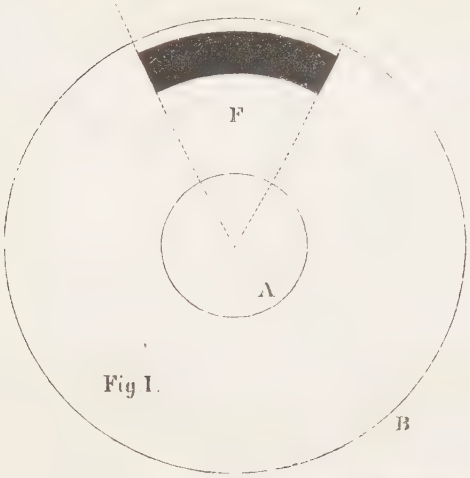


Fig 1.

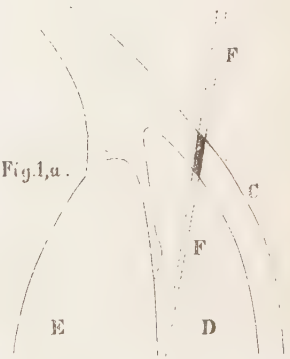


Fig.1,a.

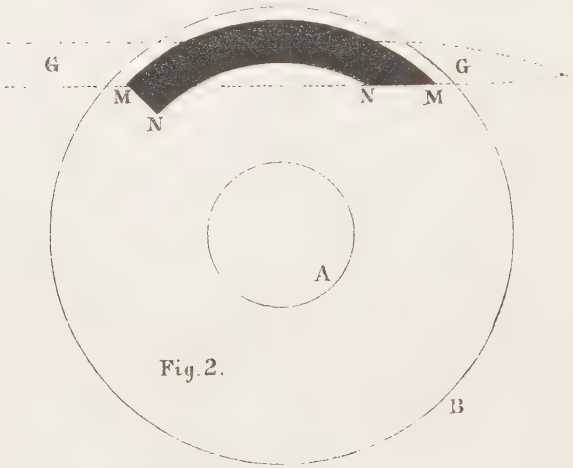


Fig.2.

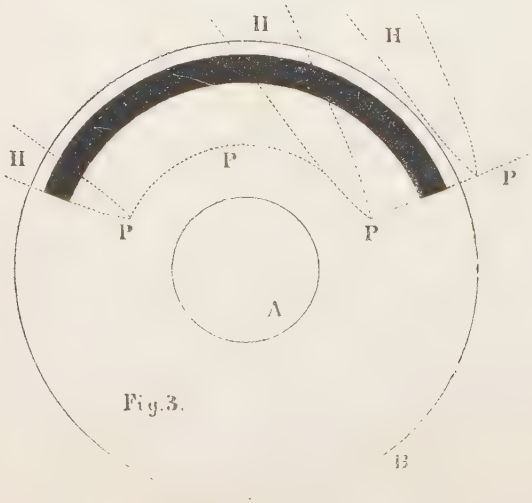


Fig.3.

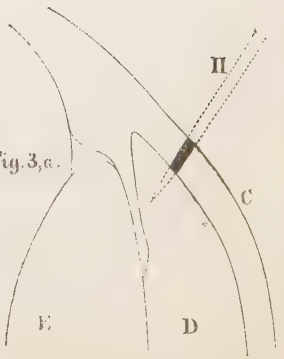


Fig.3,a.

made for practical purposes as large internally as externally. 2nd. That it need not be all in one horizontal plane, but may be made more perpendicularly or as little oblique as may be desired in any case. 3rd. That it *cannot* extend beyond the cornea.

Explanation of the Plate.

Fig. 1. Section of the cornea made by the thrust of a lance knife.
„ 1 *a*. Profile view of the upper half of the same subject.
„ 2. Diagram of a small (corneal) section made by counter-puncture.
„ 3. The more perpendicular section of the cornea that is now recommended.
„ 3 *a*. Profile view of the upper half of the same subject.
A. The pupil.
B. The sclero-corneal junction.
C. The cornea.
D. The anterior chamber.
E. The lens.
F, F. The lance knife.
G, G. The long narrow knife.
H, H, H, H. Sichel's knife.
M, M. The ostensible corneal opening made by counter-puncture.
N, N. The real ditto ditto.
P, P, P, P. The course now recommended to be followed by the knife.

M. Meyer: I have had the pleasure of seeing the author of this paper perform the operation he has described. I wish to ask him whether he would consider it to be prudent to operate in this way in a patient who is under the influence of chloroform? Would there not be danger of a too early evacuation of the aqueous, which would allow the iris to lap over the edge of the knife?

Mr. Streatfeild: It would be difficult, but possible.

On the Relief of Symblepharon by Transplantation of Conjunctiva.

By T. Pridgin Teale, M.A., F.R.C.S.

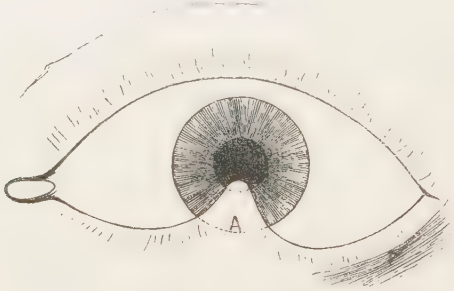
In the "Ophthalmic Hospital Reports," for October, 1861, I published a paper on this subject. The aim of the present paper is—firstly, to confirm the results previously obtained; secondly, to bring forward some improvements of detail which further experience has taught me; lastly, to impress upon this meeting a fact of great physiological interest—viz.,

the gradual fading away of the opaque material adherent to the cornea, as a consequence of the operation.

As some of my hearers may not be familiar with the cases which are suitable for this operation (for they are local, I might almost say epidemic, in their occurrence, being chiefly found in the neighbourhood of iron works), I may briefly describe the mode in which they occur.

Workers in iron who are engaged in running the molten metal into moulds, or in manipulating heated masses under the steam-hammer, are liable to be struck in the eye by heated portions which fly off from the mass. The metal usually strikes the eye below the cornea, the eyelids instantly close, and the foreign body is squeezed between the lower lid and the eyeball, producing a slough of the opposed surfaces of conjunctiva, which often reaches as high as the centre of the cornea.

It inevitably follows that the lid becomes adherent to the eyeball, A, and often to the cornea itself. Try as you may to prevent this contraction and adhesion, you must be defeated unless a new material be



interposed of the nature of that which is lost. "Naturam expellas furcâ tamen usque recurret."

The defects which result are usually of two kinds. Firstly, the eyeball is checked in its movements by the adherent lid, and the consequent dragging of the eyelid is a constant discomfort. Secondly, the portion of eyelid adherent to the cornea frequently impairs vision.

In three cases out of four these defects can be relieved, and a small proportion are absolutely cured by the operation which I am about to describe.

The operation is performed as follows:—The patient being under the influence of chloroform, aided perhaps by a preliminary subcutaneous injection of $\frac{1}{60}$th of a grain of morphia, the eyelid is first set perfectly free from the eyeball. The separation of the lid is commenced at the margin of the cornea (A), so as to leave behind any skin or opaque material adherent to the cornea, and is carried deeply into the fossa (B), between

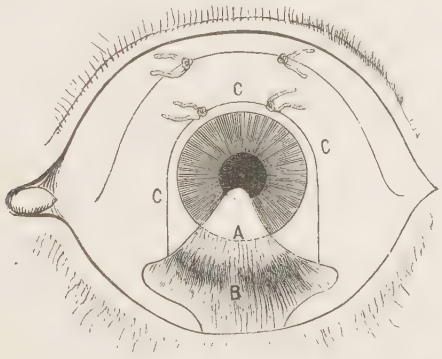
the lid and eyeball. So far the operation is easy. The next stages are difficult, and require great care and exact manipulation.

2nd. A nearly circular band (c c c) is marked out in the sound conjunctiva about $\frac{1}{4}$ inch in breadth by a very sharp scalpel or cornea knife, the outer incision being made first. This band commences at one end of the gap resulting from the liberation of the lid, passes round the sound margin of the cornea, and terminates at the opposite end of the gap.

3rd. Four stitches are then inserted near the middle of the flap, two on each edge, in order (*a*) to prevent the flap from curling up with the mucous surface downwards; (*b*) to facilitate the manipulation of the flap whilst it is being separated from the eyeball.

4th. Separation of the flap is completed by small curved scissors, the flap being held and raised by the before mentioned sutures.

5th. The flap having been separated on its *under surface*, whilst its extremities are continuous with conjunctiva, is then brought over the front of the cornea, raw surface downwards, into the new bed provided by the liberation of the eyeball from the lid.



6th. The sutures already inserted are now used for fixing the flap as deeply as possible into the fossa between the lid and globe. Other stitches are inserted so as to steady the flap *without making it tense*. It may well be imagined that such an operation is tedious, and exhausting to the operator. Every step must be done exactly, nothing left to chance. One stitch too tense, one misdirected snip of the scissors may ruin the operation. I rarely complete the operation within an hour.

Now for results.

It is a *fact* that a band of conjunctiva of one-fourth or one-third of an inch in breadth *can be spared* from the sound part of the eye without any appreciable inconvenience. This fact, which I observed in 1860, has been since abundantly confirmed by the operation of syndectomy.

It is a *fact* that a quarter of an inch of sound conjunctiva transplanted is efficient in most instances to relieve the inconvenience and discomfort of a symblepharon, and even in some cases to restore the conjunctival fossa.

On this point let us hear the testimony of Joseph Charlesworth, whose operation was done four weeks ago. I give his own words: "My lid was quite fast to my eye, and always on the drag. Now I can move the eye first-rate. I cannot now feel any difference between the two eyes."

It is a *fact* that the portion of skin left isolated on the cornea undergoes atrophy after this operation, and that in those cases in which vision has been interfered with, this fading can be accurately measured by the consequent improvement of sight. Let me give instances.

James Bishton, now present, underwent the operation a year ago, was only able to read No. 10 Jaeger at five inches—but could not read No. 8, Six months later he read No. 6. He can now make out words of No. 4.

Joseph Charlesworth, operated on a month ago. Could not see his way about with the affected eye, nor tell time by the watch, nor by the clock, nor No. 200 Snellen at two feet. He can now do all this readily, and can read No. 40 Snellen at 20 feet. He could not read No. 20 Jaeger; he can now read No. 2 Jaeger.

Note A. On the Stitches.—The first four stitches are inserted as follows. A fine silk thread is passed twice through the eye of a small curved needle. The needle, held in a holder, is inserted at the edge of the flap and tied in a single knot and allowed to hang at one side, the needle being prevented slipping off the thread by the double passage of the thread through the eye. The four stitches are thus attached, each with its needle ready to complete the suture after the flap has been transferred to its new bed.

For fixing the sutures it is well to aim at spreading out the flap as much as is consistent with freedom from tension.

Note B. On the Flap.—It is a question whether it be not better, after marking out the flap and inserting the stitches, to divide the flap into two between each pair of stitches.

Mr. Wolfe: In the part in which I practise we have the same disease. I modify the operation considerably. Instead of taking a band of conjunctiva, I go first to the conjunctival cul-de-sac, take out a flap, divide it, bring it down, and bring it to the lower conjunctival cul-de-sac. This is necessary when we have got a large symblepharon covering the whole extent of the pupil. In fact, in three cases, before transplanting, I had to perform an iridectomy. Under these circumstances, however,

there always remains a bridge in the middle. In one case I had to take a flap also out of the upper eyelid. I have practised this operation under the name of "plastic operation on the conjunctiva," and I was about to publish a paper on the subject, but, after examining the records, I found that to Mr. Teale belongs the credit of the initiative. From the first, instead of crossing the incisions, I always take out a part of the conjunctiva, dragging it down to the lower eyelid.

M. Meyer: I regard Teale's operation for symblepharon as one of the greatest improvements in ophthalmic surgery. It can, however, only be attended with success when great care is paid. The operation is a very troublesome one, especially when performed in accordance with the author's original statements. The two conjunctival flaps can only be fixed in position with difficulty, so great is their tendency to roll in; and I quite approve of the idea of inserting several sutures into them before they are detached. We may expect that perfect union will take place between the two upper conjunctival flaps in the present modification of the operation.

On the Advisability of Adopting the Metrical System for Estimating the Amount of Ametropia.

By Dr. Javal.

At the Paris Congress, a Commission composed of MM. Becker, Donders, Giraud-Teulon, Javal, Leber, Nagel, Quaglino, and Soelberg Wells, were instructed to consider the best means for substituting the *mètre* for the *foot* in the measurement of defects of refraction and accommodation. All the members of the Commission were agreed—

1. That the mètre ought to be substituted for the foot.

2. That lenses should be numbered in accordance with their focal length, and not according to the radius of their curvature, as is ordinarily the case. The only point on which some disagreement existed was in the selection of a lens which should represent unity; I proposed that of 48″, and M. Nagel that of 1 mètre focus.

Five members of the Commission, MM. Becker, Javal, Leber, Nagel and Soelberg Wells, agreed that after serious consideration, notwithstanding the objections of M. Nagel, and in opposition to the conclusions contained in an interesting memoir by M. Porro, which had been sent in by M. Quaglino, the following series should be recommended to you for adoption:—

No.	Focal length in centimetres.	Radius of curvature in Paris inches.	No.	Focal length in centimetres.	Radius of curvature in Paris inches.
1.	240	96″	13.	18·4	7·4″
2.	120	48	14.	17·1	6·8
3.	80	32	15.	16	6·4
4.	60	24	16.	15	6
5.	48	19·2	17.	14·1	5·6
6.	40	16	18.	13·3	5·4
7.	34·3	13·7	19.	12·6	5·05
8.	30	12	20.	12	4·8
9.	26·6	10·7	21.	11·4	4·6
10.	24	9·6	22.	10·9	4·3
11.	21·8	0·7	23.	10·4	4·1
12.	20	8	24.	10	4

After the completion of the first half of the scale, the second half may be continued in alternate numbers, thus :—

26.	9·2	3·7	38.	6·3	2·5
28.	8·5	3·4	40.	6	2·4
30.	8	3·2	42.	5·7	2·3
32.	7·5	3	44.	5·4	2·2
34.	7·05	2·8	46.	5·2	2·1
36.	6·6	2·7	48.	5	2

If four out of five members of your Commission expressed themselves in favour of the series commencing with the lens 240, it was solely on this ground, that no other presented so convenient a basis in point of power, and at the same time afforded so many convenient divisions.

Allow me to add, that a lens of 240 centimètres focal length is almost exactly equal to a biconvex lens of 96 inches radius, if we take as a type the Paris foot and Crown glass. The difference between this and the Berlin foot, which ought soon to be given up, may be neglected. The difference of the English foot would be of greater amount.

It should be observed, however, that the Paris foot has always been used by M. Donders, and the adoption of the series that we propose to you will permit future generations to read without trouble the valuable work published by the Sydenham Society, since the numbers of our series reproduce the $\frac{1}{24}$ of M. Donders.

In conclusion, we can without inconvenience suppress certain fractions in the proposed series, and write

17, 13, 11, 9, and 7 cm. in place of
17·1, 13·3, 10·9, 9·2, and 7·05. cm.

I have the honour to propose the adoption of the series of which the first scale is marked by a lens of 240 centimètres focal length.

Mr. Carter: During the last four years I have employed exactly the same series that has here been proposed and have found that it has answered well in every respect.

M. Donders: The observations that have just been made by M. Javal are equivalent to a report of the Commission. Many amongst us have considered the question since the opening of this session of the Congress. We propose that you should accept the proposition that has been made, and sign this memorandum that has been drawn up by Mr. Soelberg Wells. "The undersigned have the intention of adopting the decimal system for designating the degrees of ametropia and the required glasses, adopted at the International Ophthalmological Congress, to commence in July, 1873:—

Professor Donders.
Dr. E. Meyer.
George Cowell.
T. Shadford Walker.
T. W. Black.
Dr. Edwyn Andrew.
D. B. St. John Roosa.
Dr. Desjardins.
C. R. Agnew.
L. de Wecker.
Dr. Osio.
Dr. Delgado Jugo.
Dr. Brettauer.
Dr. Javal.
Soelberg Wells.
L. Warlomont.
Dr. Leonhard Hirschmann.
Dr. Edmund Hansen.
D. Doyer.
E. Williams.
Jabez Hogg.
M. W. C. Gori.
Dr. Blessia.
W. Bowman.
Frederick Mason.
Dr. Bribosia.
J. F. Streatfeild.
D. Riccardo Secondi.
Henry Power.
Dr. Quaglino.
G. Critchett.
L. Gulstad.
Dr. B. Joy Jeffries.
Dr. Schroeders.
Dr. G. Hänel.
Dr. Léon Noël.
Dr. Alph. Maureau.
Dr. L. Carreras y Arago.
F. Buller.
Dr. Nieden.
Dr. Hermann Pagenstecher.
Henry D. Noyes.
Dr. M. Woinow.
Dr. Vogelsang.
E. Dyer.
C. E. Fitzgerald.
Dr. W. Hess.
Dr. Ewers.
Dr. Galezowski.
Dr. J. Coppez.
Dr. Weber.
James Walker.
R. Brudenell Carter.
Dr. Gama Lobo.
Zehender.

Mr. Brudenell Carter: I am anxious, Sir, with your permission, to say that I have had this precise scale in use for three years, and I have found it work with the greatest possible convenience to myself; but it has the inconvenience of having to be translated into inches for the mechanicians. The scale itself is admirable. I cannot too strongly recommend the Congress to adopt it unanimously.

M. Donders: This, then, is the reply given by the Committee on this subject nominated in Paris. It is desirable that after a certain date—say July, 1873—the above data will be employed. Mr. Wells will have the kindness to read the proposition to us.

Mr. Soelberg Wells did so.

M. Meyer: It would be desirable, before the publication of this scale with strong glasses, that the fraction of the same numbers should be harmoniously arranged.

A Member: Before you lay down this table as law I would beg to mention the confusion———

M. Donders: There is no question of law. A confusion cannot, therefore, occur. The subscribers merely signify their intention to adopt this scale, without being under any further obligation. M. Schmidt will now be good enough to favour us with his contribution regarding the neuritis optica intraocularis occurring in tumours of the brain, and the consequent œdema of the optic-nerve sheath.

M. Schmidt: I was unfortunately absent when M. de Wecker's paper was read, or I should have asked leave to make some observations in regard to the origin of the "stauungs papille," which is met with in cases of tumour of the brain. The important injection-researches of M. Schwalbe, as is well known, first demonstrated that a communication exists between the sub-arachnoid space and the sheath of the optic nerve. I am able to corroborate his statements, and have further observed that even in cases where the presence of coloured fluid in the subvaginal space of the optic nerves was hardly demonstrable, a greater pressure existed close to the bulbus, and that even an injection of the lamina cribrosa was possible. The latter, indeed, but rarely succeeds; at least, recent experiments by myself and others have only yielded negative results. My view of the origin of the "stauungs papille," based upon these experiments, was obvious. An increase of the intracranial pressure must force fluid from the arachnoid into the sheath of the optic nerve, and

cause œdema of the lamina cribrosa. This, however, exerted pressure on the vessels, and especially on the vena centralis retinæ, and the phenomena of pressure with exudation; in short, the neuritis intraocularis optica were produced. I will just mention to refute an objection that has been raised against this theory. It has been maintained that the pressure requisite to force fluids experimentally injected into the optic-nerve sheath from the arachnoid cavity was too high to permit the functions of the brain, or even life itself, to continue. But, in answer to this, it may be said that the conditions present during life are entirely different from those that exist after death. During life only a very small increase of the intracranial pressure is required to force the fluid situated nearest to the foramen opticum through its aperture of exit into the optic sheath. But in experimental investigations we are necessarily compelled to use greater pressure to force the coloured fluid from the point of puncture through the entire arachnoidal sac into the sheath of the nerve. Yet this is the only means by which we can satisfy ourselves of the existence of an intercommunication between the two. Some very interesting experiments on living animals were made by Manz, who injected fluids into the arachnoid space, and noticed that perceptible changes were produced in the papilla optica when examined with the ophthalmoscope. It now becomes necessary to inquire whether this theory be supported by pathological researches. I may pass over the changes in the optic nerves themselves, which, in the majority of cases, have their chief seat in the vicinity of the lamina cribrosa. The absence of any intelligible continuity between this process and the brain led to Von Graefe's and Benedikt's explanations. In order to demonstrate a rise of the intracranial pressure it is necessary on post-mortem examination to take into consideration the tension of the dura mater. In all cases that have fallen under my notice of cerebral tumours with simultaneous neuritis intraocularis the tension of the dura mater has been considerably increased. An inspection of the reports of the post-mortem examinations made during several years in the Pathological and Anatomical Institute of Berlin, which Professor Virchow kindly permitted me to make, showed the frequency of this condition in cases of cerebral tumour. In regard to the communication between the arachnoid space and the optic-nerve sheaths, additional evidence of its existence was derived from a case in which, coincidently with purulent

basilar meningitis, pus was discovered within the optic-nerve sheaths. Similar observations have been made by others. It remained to ascertain whether the optic-nerve sheaths were distended with fluid in neuritis intraocularis. To this point I have paid special attention from an early period, and have always found a certain degree of moveability of the external sheath of the optic turns over the internal, without, however, being able to state the relative degree. In cases that are by no means rare I found an extraordinary and undoubtedly pathological dilatation of the sheath near the papilla, on cutting into which a considerable quantity of serous fluid escaped. To avoid deception I have examined the parts in question in many who have died from disease other than that of brain tumour, and have never found any considerable œdema present, whilst in cases of brain tumour it was sufficiently common. My own specimens confirm this statement. I may further observe that in well-marked atrophy of the optic nerves considerable relaxation of the optic-nerve sheaths exists with dilatation of the subvaginal cavity. In neuritis intraocularis the dilatation is essentially situated near the bulbus, and is observable even before the vision has been in any way impaired. The existence of this dilatation of the subvaginal cavity, to which I called attention in the middle of last year, in a letter to Dr. Flarer, and which has been published in the Milan "Journal of Ophthalmology," has been also confirmed by Dr. Manz, who has described it under the term of hydrops vaginæ nervi optici. Dr. Manz recognised it in various forms of cerebral disease. Thus all observations, both physiological and pathological, support my view of the origin of the "stauungs papille." The mode of treatment suggested by M. Wecker, therefore, seems to me to be perfectly rational.

Dr. Green (St. Louis): I have a few words to say on the subject of test letters. The test letters of Snellen are and must be our standard, but there seems to be some improvements which may be made upon that series. First, with regard to the forms of the letters. The typical letter of Snellen consists of a square subdivided into several smaller squares within which the letter is described; but on examining them, while some letters are bounded by five in width and in height, some are larger, six squares in width and five in height. I have for several years occasionally drawn sets of letters with a view of correcting this slight defect

to a certain extent. The letter H, defective in Snellen's from being too broad, I have made of such a form that it can be exactly inscribed within a square. D, I have modified by cutting off a portion from the back of the upper part. Suffice it to say, that rejecting some letters of Snellen, and not attempting to make the letters absolutely uniform, which would satisfy a printer or a sign painter, we can get a sufficient number of them circumscribed accurately within a square. Another source of error grows out of the fact that the round letters, O, for example, are of smaller area than the letters composed of right angles. Another modification, and one more important, is the arrangement of the series. We have had series which have been called regularly progressive, and yet the progression has not been regular, not regular geometrical progression from one size to another. It has been desirable to retain as far as possible all the numbers introduced by Snellen, and at the same time it has seemed to me desirable to have a uniform geometric ratio regulating the size and height of the letters. I have begun with the simplest ratio possible. Taking the ratio of ·5 and finding that insufficient I have taken the ratio of ·7. That gives us a series interposed between the others, but that was not satisfactory either, because it caused the rejection of too many of Snellen's standard. I then took the cube root 9·5, ·8 nearly, and found that it preserves all the essential numbers of Snellen's types. As a practical matter this is of considerable importance. In taking the tests given by Snellen we have rows of letters of different sizes, and it takes us some time to get the patients through from top to bottom. I have proposed to have the letters in a rectilinear series, and I can get the whole series on a card less than three feet long.

The following paper gives Dr. Green's views in a little more detail:—

On Some Improvements in Test Letters.

By John Green, M.D., *of St. Louis, United States.*

Test letters for measuring the acuteness of vision should fulfil, as far as is practicable, these conditions:—

1st. Uniformity of size and plan of construction, as between the different letters employed.

2nd. Regularity of gradation in size in the successive numbers; and,
3rd. Convenient arrangement for easy and rapid use.

Absolute uniformity of size as between the different letters of the alphabet is not attainable; **C, G, I, J** and **O** are, from their construction, of exceptionally small area, while **M** and **W** are exceptionally large. **B** and **S**, when drawn as square "block" letters, are somewhat difficult of recognition, owing to the crowding of their horizontal elements, while **Q**, from its peculiar form, cannot well be represented as a "block" letter. The remaining sixteen letters, **A, D, E, F, H, K, L, N, P, R, T, U, V, X, Y** and **Z**, can be drawn of pretty nearly equal dimensions without doing great violence to the rules of good proportion; their forms are, moreover, so far characteristic as to make the recognition of one letter about as easy as that of another. In the formation of the letters I have followed H. Snellen (Letterproeven, Utrecht, 1862), but with certain changes of plan, adopted for the purpose of attaining greater uniformity. The principal departure from Snellen's work consists in making the cross-bars at the ends of the vertical limbs of the letters shorter, in the proportion of 2 : 3, thus opening out the letters and giving them a lighter and less crowded appearance. By making this change it has been found practicable to draw the letters of more nearly equal dimensions than in Snellen's work, with the additional advantage of somewhat better proportion.*

A regular gradation of numbers in geometric progression is a desideratum, which needs only to be suggested to command favourable consideration. At the meeting of the American Ophthalmological Society, for 1867, I exhibited a chart of test-letters, in which the constant ratio, $1 : \sqrt{.5}$, (1 : 0.7069) was adopted. This series contained, however, too few of the numbers in most frequent use, and too many fractions in the lower numbers; it was, therefore, never engraved. At the next meeting, 1868, I presented a new series, constructed upon the ratio, $1 : \sqrt[3]{.5}$, (1 : 0.7937) which was published in the Transactions for that year. This series includes all the most important numbers of Snellen, and contains very few fractional quantities. After four years of con-

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* A chart of test-letters upon the same scale as Snellen's, but of simpler construction (**C, F, S, E, U, H, O, T, D, L**) was drawn by the writer for Dr. H. W. Williams' "Recent Advances in Ophthalmic Science," Boston, 1866. The same construction was also adopted in a series of geometric progression published in the Transactions of the American Ophthalmological Society for 1868. A fair trial of these letters has shown that they are not so easily recognised by most persons as the original letters of Snellen, or the modified forms now presented.

stant use, I now venture to recommend this ratio of gradation for general adoption.

In using Snellen's test-letters, and still more with the new series, considerable time is lost in reading through the several lines of letters. This is often a source of very considerable inconvenience, especially with dull patients, and in the hurry of hospital and infirmary practice. I have, therefore, prepared a sheet of letters for rough determinations, which contains but one letter of each number and in which the letters are arranged in a single line. An example of this arrangement accompanies this paper; it will serve also to illustrate the new construction of the individual letters, and the new scale in geometric progression.

On Some of the Pathological Changes in the Choroid, Vitreous and Retina consequent on Disease of the Anterior Part of the Eye.

By Dr. Hermann Pagenstecher, *Wiesbaden.*

I propose briefly to give you the results of a series of investigations which I have made during the last few years on some of the pathological changes within the eye, with especial reference to the changes which the choroid, retina, and vitreous body undergo in consequence of diseases of the anterior part of the eye. You all know that an eye may be totally destroyed after an apparently slight primary disease of cornea, iris, and ciliary body, by the morbid process communicating itself to the other membranes of the eye. The final result may be either atrophy of the eye or a glaucomatous degeneration. The opportunity of examining such eyes is not uncommon, so that the changes of choroid, retina, and vitreous body are pretty well known. They are described in every book about ophthalmology as displacements, as atrophic processes, or as new formations of different kind. I will not, therefore, trouble you with a long description of these atrophic states, or at least of their final condition, but I will draw your attention particularly to the early states of the changes in those membranes. As far as I know, there has been but little mention in our literature of those changes in the retina and choroid which occur during diseases of the anterior part of the eye; and yet, in a great many cases, they are so distinct, and at the same time so important, that they ought not to be neglected. The reason that they have not hitherto been mentioned is to be found in the difficulty or impossibility of examining such eyes with the ophthalmoscope, and the few opportunities which occur for dissecting such specimens. If, in consequence of a large ulceration or of a pannus, the cornea is quite opaque, we generally suppose that the retina and choroid are quite healthy if we find a good perception of light. This

conclusion is not always correct; for a retina may retain quite a normal perception of light, and may yet show distinct anatomical changes, a fact which is well illustrated in some cases of optic neuritis after brain diseases. As I mentioned above, we have very few opportunities of examining with the microscope eyes excised during a somewhat early stage of active change in the anterior part, and I can give you the results of only a small series of cases. With the exception of eyes affected by traumatic cyclitis, they were six in number. In all these cases the cornea was totally, or almost totally, destroyed by different ulcerative processes of the cornea, and there had been an irritation of the ciliary body for a long time; the shape of the eyeball and the perception of light was still good. I do not include in this series cases of idiopathic iridocyclitis, because in many of them the choroid is also primarily affected; and at the same time I omit those affections of the anterior part of the eye which are produced by a constitutional cause.

The results of my investigations are shortly and generally as follows. All severe diseases of the cornea which are connected with a great irritation of the iris and the ciliary body produce distinct changes of the choroid, retina, and vitreous body. In their first stages these are only very slight and have no influence on the function of those membranes; they may totally disappear with the primary disease. If, on the other hand, the disease should last for a long time they will gradually increase, and lead finally to very important alterations. I think that in all those cases we must regard the ciliary body as the organ through which the disease is transferred backwards, but still it is not at all necessary that well-marked clinical cyclitis, with its characteristic symptoms, great pain in the ciliary region and diminution of tension, should exist. In describing the changes I cannot now give you a minute description of every case I examined; I shall, therefore, place the changes which I have observed in this series in what appears to me to be their natural order.

The first influence which a long-lasting irritation of the ciliary body produces in the retina and choroid consists in a distinct hyperæmia of those membranes. This is easy to demonstrate in the choroid as a great dilatation of all the blood-vessels and thickening of the whole membrane. This hyperæmia seems to produce, or at least to be followed by, serous infiltration into the tissue of the retina, characterized by swelling of all its layers, and producing very often the appearances of a real œdema retinæ. The swelling is generally most pronounced at the disc and its neighbourhood. In some cases it may reach such a high degree that it produces changes like those of a real optic neuritis. The disc is hyper-

æmic and œdematous, the nerve-fibre layer rising, mushroom-like, over the edge of the choroid and pushing back the other layers of the retina. In one case I could demonstrate at that part a distinct swelling of the nerve-fibres. Twice I found, together with the above changes, a great swelling of the yellow spot; it was produced by an œdematous state, especially pronounced in the so-called outer fibre layer, and was characterized by the formation of large and small oval spaces parallel with the fibres. There was in both cases a great dilatation of the outer sheath of the optic nerve, and an increase of connective tissue between the two sheaths directly behind the eye. This, as well as the fact that such dilatation is to be found sometimes in glaucomatous eyes, proves that this change is not always produced by an increased intracranial pressure and by the percolation of a serous fluid from the arachnoid space between the two sheaths.

Another kind of pathological change resulting from diseases of the anterior part of the eyeball consists in the infiltration of choroid retina and vitreous body with lymphoid cells. It either follows or is connected with a distinct hyperæmia and thickening of retina and choroid. I have very frequently found this change after traumatic iridocyclitis. In recent cases the infiltration is only a very slight one. In the retina the lymphoid cells are to be found generally in the nerve-fibre layer and in rows directly under the limitans interna. The last sometimes shows foldings. The same lymphoid cells, as well as star-and spindle-shaped cells, are to be found in the vitreous body, and most abundantly near to the elastic membrane. If the process continues and passes to a later stage, the choroid then gets uniformly infiltrated by lymphoid corpuscles. The infiltration of the retina does not increase in the same proportion, but the affection of the choroid produces quite distinct changes in the layer of the rods and cones, leading to total loss of the function of this membrane.

It is evident that the short description which I have just given of the changes referred to cannot pretend to be complete; for this purpose the material was much too small. But my observations prove that the diseases mentioned exert an influence on the other parts of the eye of sufficient importance to be mentioned, and not to be neglected in practice.

Needle-hooks in Secondary Cataract Operations.

By J. F. Streatfeild.

It is a very numerous class of cases in which, when the lens has been removed by extraction of cataract or otherwise, there is found to be a

membranous opacity in or behind the pupil, for which it is necessary that some operation be done in order to get unobstructed admission of light and to gain good vision. The opacity is either the essential result of the cataract, of which the greater part has been removed, or it is a consequence of an adventitious inflammation following its removal; and the opacities vary in all degrees from the film which can only be seen at all by the concentrated light of oblique illumination, when the pupil has been dilated, to the dense white mass filling the contracted pupil that cannot be dilated. With these extreme cases—the most serious of the results of inflammation, I am not now concerned—an iridectomy is required, and subsequent proceedings such as may be then shown to be necessary. Nor am I concerned in the cases of the other extreme, those in which the opacity is of the slightest kind and only to be discovered by the concentrated light of oblique illumination: in these cases a single fine needle is all-sufficient, and by its use a perfectly satisfactory result is with the greatest facility obtained. The needle passes through these films without any feeling of resistance or any appearance of dragging upon any of the parts concerned. The cases of which I wish to speak are those in which generally of late years, when any considerable resistance has been anticipated, or when, in the use of the first needle employed, it has been experienced, a second needle has been introduced on the opposite side and the dragging thus has been divided between them, each counteracted the other, and the dragging laterally was not much in any *one* direction. This was a wonderful improvement—the resistance and dragging force are halved and distributed, but it is not perfection, and therefore we need not be satisfied with it. The dragging laterally in these operations is not the only dragging. There is a dragging to the side towards which each needle is being moved, counteracted by the *two* needles, but *there is also a dragging backwards*, which is unopposed, when the needles will not enter at first and also afterwards, when the rent can only with difficulty be made because of the toughness of the membranous opacity *and because the points of the needles are less widely separated than any other parts of them*. Any amount or kind of dragging is to be feared for its effects on the circumferential parts to which the membrane is attached, and the greater probability therefore of an after-inflammation. But it seems to me that there is a specially prejudicial effect of this *backward* dragging of which I speak—viz., that it compresses the vitreous body, and when the membranous septum is opened and the needles have entered (perhaps very suddenly at last) and they are at once separated, there is a sudden and violent and considerable prolapse and displacement forwards of vitreous humour. When the rent is made in the membranous septum with some force,

more or less exerted in the backward direction, the vitreous humour advances by reason of its natural elasticity, *and it is led forward by the stems of the two needles inserted deeply into it.* Now if this displacement were slight I should not consider it any objection to the operation; indeed, I believe a slight prolapse of vitreous humour in these cases for a time to be actually an advantage by distending the newly made opening, keeping its edges apart for awhile; and as it tends also to a *rounding* of the aperture, but we cannot make certain of this moderate result, and if a large quantity of the vitreous humour be made to advance through a somewhat narrow aperture in the membranous septum, it becomes locked there and never recedes: it hampers the iris in its movements so that it cannot contract, and robs the vitreous chamber of some of its proper contents. I speak of general recollection, but, again, I do not think the results of such cases are altogether good in respect of vision. These cases in which a considerable part of the vitreous humour is brought forward and locked in the aqueous chambers, as a result of the needle operation for membranous opacities after removal of a cataractous lens, may be recognised by a very deep anterior chamber, by a very much rounded and irregular and well-defined black aperture in the opaque septum, the pupil of considerable size, and never contracted or capable of contraction, and if at the time of the operation the iris has been made to bleed, the case is then quite unmistakable by the appearance of a ring of blood all round the circumference of the anterior chamber—that is to say, in the small part of it not occupied by the vitreous protrusion, which is of course transparent. The iris is much displaced and drawn backwards, out of its natural position, perhaps also it is in some degree compressed. The eye has a very ugly, unnatural appearance, and, as I have said, the final result of the case is incompatible with good vision. The results I have been describing are no doubt the worst, but I have been led to fear any considerable displacements of the vitreous humour in the ordinary operations, and when the vitreous body has not been thus permanently locked in the aqueous chambers and has receded, the risk of its not receding has been incurred, and much dragging force in the backward direction has, at any rate, been exerted on the circumferential parts at the time of the operation, by which an inflammation might have been excited.

[The *object* of the secondary operations for cataract is, I presume, to gain a sufficiently large central aperture in the opaque membrane, and to do this with as little disturbance of the neighbouring parts as may be. I do not often myself like to attempt the removal of these membranous opacities altogether in any way. As to the *time* of operating, I believe

that if the pupil can be well dilated with atropine, the operation should be done as soon as all appearance of redness in the ciliary region has finally disappeared. For these membranous expansions, at all events if there has been inflammatory mischief, become more and more tough and hard to tear by age, so that the operation should not be very long deferred. But nevertheless if there has been iritis, and especially if there are posterior synechiæ which cannot be detached by atropine, and prevent the dilatation of the pupil, I think, for fear of a consequent recurrence of iritis, the operation must be deferred for a month or more after all redness has disappeared in the eye.]

The use of two needles at once, acting and counteracting for and against each other, was originally Mr. Bowman's improvement, and was suggested by him twenty years ago. About three years ago (see the "Ophthalmic Hospital Reports," vol. vi. pp. 209-213) Dr. Agnew and Dr. Noyes of New York suggested further improvements. The former of these gentlemen (loc. cit.) makes two opposite openings in the corneal margin, one after the other, and the broad needle in one of the openings is advanced so as to penetrate the membranous septum, and held in this position. Then a small hook is entered at the opposite opening in the cornea and through the hole made in the septum, and then, with the broad-needle as a point of resistance, the hook is made to tear an opening. Dr. Noyes (loc. cit.) uses two hooks introduced at opposite sides by openings previously made in the margin of the cornea, by puncture and counter-puncture, with a long narrow knife, which is also made to penetrate the membranous septum before it is withdrawn, so as to get an opening by which the hooks are introduced. For in either of the operations last mentioned *blunt* hooks are employed. In either of them the aqueous humour must be almost entirely evacuated, and the anterior chamber lost.

The power that is obtained by the use of two hooks on opposite sides is very great, and has the inestimable advantage that it operates on the membrane itself, and does not drag upon the iris or other parts so as to create a probability of exciting inflammation by which the opening made may be very probably again closed. If there are no posterior synechiæ, but a dense or tough membrane behind the pupil, I would still use the two hooks; but then, although no dragging could be exerted on the iris by any other mode of operating, other parts behind the iris to which the false membrane is attached might be injured in the same way and with a no less serious result. It is a great disadvantage if, in using the two opposite hooks, the aqueous humour must be previously evacuated, and I am about to prove that this need not be done, but that on the contrary it may be all retained during and after the operation.

The advantages of the non-evacuation of the aqueous humour are, first, that we can *see* what we are doing so very much better when the cornea is normally distended, and secondly, that we have *a space* in which can turn about the hooks and do all this without bruising or even touching the iris, as they are introduced to the membranous septum upon which we intend to operate. I have always carefully avoided, in these cases, the removal of any part of the iris tissue or of the membranous septum itself, which, if I am not mistaken, Dr. Agnew and Dr. Noyes in their operations have, as a rule, drawn out and excised. My object has been to make a rent in the membranous septum without touching the iris or interfering with it in any way, so as to avoid the dangers of iritis and make a sufficient central pupil only. I have found that I could do this perfectly well by using two cataract needles bent at their ends into small hooks. The hooked parts should be of small extent and of slight curvature. At first (about a year ago) I made use of two of the common "sharp-hooks" that are sometimes used to recover a lens that is fallen into the vitreous chamber. But although I could introduce them, and make successful use of them, it was with very much difficulty, because they taper gradually to their sharp points. And since that time, I have had several pairs of "needle-hooks." The needles I have had thus bent are of the stouter kind of the ordinary cataract needles with the small lance-like points of cataract needles, and perfectly round beyond the part which is bent into a hook. The hook is $\frac{3}{20}$ths of a French centimetre in extent, and should make but a small section of a large circle. In using them—an anæsthetic having been given and the pupil being dilated by atropine as much as possible—I first secure the eyelids with a spring stop-speculum, and then, with one of the needle-hooks in either hand, I place the sharp points of the hooks one on either side of the cornea near its margin, and then, the handles of the two hooks being close together or even across, I press the needle points into the cornea, observing first one and then the other, and when the hooked parts of the needles have traversed the cornea, the handles may be separated and brought horizontally, right and left, and the needles at the same time passed on towards the centre of the anterior chamber. The next thing is to turn the hooked extremities down towards the membranous septum and penetrate it in the centre. As soon as one of the needle-hooks has entered the membrane the point of the other is brought to oppose it, and the two being entered at the same place are drawn slowly in opposite ways. These membranes are often stouter or more tough in some parts than in others, and if the one hook seems to tear readily, and the other but little, the traction should be made principally

with the latter, so that the aperture be made more centrally. It should be of some considerable size, as it will become afterwards somewhat smaller than it is at first, and when the rent is made and the needle-hooks are to be withdrawn, they are at first, each of them, advanced a little towards the centre of the opening and then turned with the points forward and brought in opposite directions towards the cornea; then the handles of the instruments being brought up and together, as at first, the instruments are easily withdrawn by following the little curve of the hooked ends as they are brought out.

The objections made to the operation are all on the score of the difficulty of its performance. Some have suggested indeed that the little hooked ends would be likely to be broken off within the eye, but I do not think this can ever happen if we employ a good instrument maker, and are careful in manipulation. I have never had iritis or any other ill result of the operation. The aqueous humour being all retained, we have *plenty of room* in the anterior chamber, and we can *see*, as I have said, perfectly well all that we do, and can proceed very leisurely. I *have* found the penetration of the cornea difficult; but then I, at first, had the "sharp-hooks" which have points like those of women's sewing needles, not the little lance-like points of cataract needles; and then I had a second pair of hooks too small and a third too much curved, and with another pair of "needle-hooks" that were made for me, though I could easily penetrate the cornea, I could not rotate them when entered, so as to turn the hooks downwards, because the flat part of the extreme ends of the needle-hooks extended, as in some of the ordinary cataract needles, some way up the stem. Now the recurrence of any of these mistakes may be considered to be impossible. The needles should be of the stouter kind of ordinary cataract needles; the hooks should not be much curved; their points should be lance-like, but the flattened part of the points should not extend beyond the part that is bent into the shape of a hook; their stems should be equal in size, in each of them, throughout their length, so that, as in all well made cataract needles, the aqueous humour is perfectly retained whilst they are in use.

With two hooks a *very much increased power* in making and regulating the size of the opening is gained, the risks of dragging the membranous septum *in a backward direction* are obviated, so that the chances of inflammatory mischief are very much lessened and much displacement of the vitreous humour is rendered impossible.

In Mr. Bowman's operation the lateral dragging is obviated and the aqueous humour is retained: in Dr. Noyes' operation the backward dragging also is obviated, but the aqueous humour is evacuated: with a

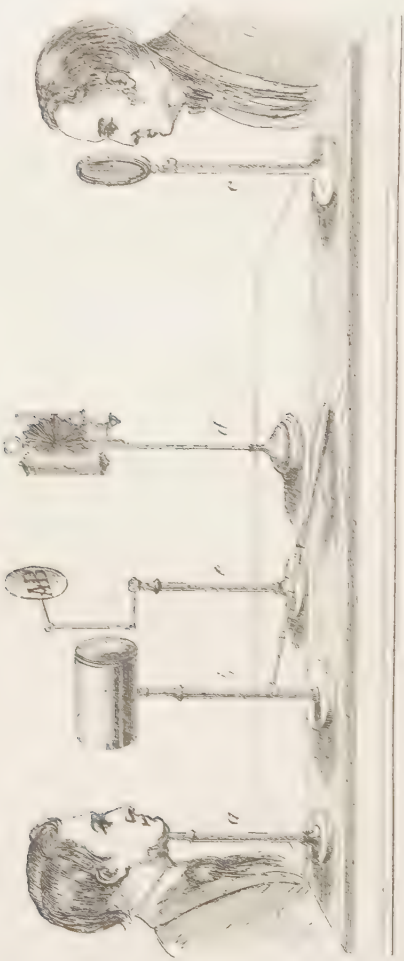
pair of needle-hooks the lateral and backward dragging are both obviated and the aqueous humour is retained, the iris is unaffected, and all the steps of the operation are apparent.

A Class or Demonstrating Ophthalmoscope.

By Jabez Hogg, *Surgeon to the Royal Westminster Ophthalmic Hospital, &c.*

At the Royal Westminster Ophthalmic Hospital various forms of demonstrating ophthalmoscopes have been tried and found wanting, consequently all were quite thrown aside long before I chanced to see Dr. Burke's reflecting mirrors in use. The demonstration I witnessed with this instrument was to a certain extent gratifying, although not perfectly satisfactory. Certain difficulties in its management produced doubts in my mind, and I ultimately came to the conclusion that it would not prove to be the practically useful ophthalmoscope I had in vain long looked for. Certainly for brilliancy and magnification of the image it was decidedly superior to any other in use. I soon became aware of defects due to the form and arrangement of the mirrors, and these I set to work to correct; but before my alterations were finished, I happened to be present at one of the evening meetings of the Medical Society of London, when Mr. Carter exhibited his modification of Burke's instrument, and which elicited a well-deserved meed of praise from the members present. This ophthalmoscope consists of the following parts—a biconvex lens of eight inches focus, a perforated mirror of thirteen inches focus, a chin-rest and lamp, each supported on an upright adjustable tube. An instrument simple in construction, easy of management, and affording excellent results, it seemed to be all we could wish for; on a closer acquaintance, however, some slight defects began to show themselves. It was found that the flood of light thrown off by the large mirror was productive of annoyance to those patients suffering from inflammatory forms of disease; that in some other cases a blurred and exaggerated appearance of the disc and vessels was observed; and only within a limited area was the image rendered perfect or equal to that obtained by the small hand-ophthalmoscope. It is, indeed, almost hypercritical to point to distortion, want of sharpness, and so forth, in an image produced by a biconvex lens of long focus and four inches in diameter, the imperfectly finished surfaces of which give an increased amount of spherical and chromatic aberration, and a series of annuli with their confusing effects, rendered still more confusing and palpable when thrown upon the convex and concave surfaces of the eye. To lessen the evils spoken of I resolved

to employ two plano-convex lenses of 9 inches focus, 23 centimetres, when combined of about 4½ inches, with their convex sides turned towards parallel rays, which at once reduced the aberration to about one-fourth of that of a single lens in its best form. This gave far better results. By mounting each lens in a separate piece of tubing—one tube



a, Concave chin-rest, supported on a vertical tube, and made to slide up and down in an outer tube, and fixed by a lifting screw at any convenient height. *b*, Pair of plano-convex lenses, with long horizontal handle fixed to lower part of tube, and sheathing out towards the observer for assisting in adjusting the focus. *c*, Mirror hung in a gimbal by screws. The eye of the observer, when placed close to the central opening, is supposed to be forty inches from that of the patient. *d*, An Oxford reading lamp, with screen for protecting the eye. *e*, Moveable disc, with bold letters printed on its face, for fixing and directing the attention of the patient, and keeping the optic disc well in the field of view. By the substitution of a pair of plano-convex lenses, the spherical and chromatic aberration is corrected, and a more perfect image of the fundus obtained.

being slightly smaller than, and sliding within the other, for the purpose of accurately adjusting the two—I obtained a sharp, well-defined image of the fundus oculi, far superior to, although not so much magnified as that

obtained by employing a biconvex lens. A reflected image of the mirror annoyed me for a time, but this I got rid of by the insertion of a diaphragm, and by making the lens nearest the observer turn on its vertical axis, thus giving it a moderate degree of obliquity. An erect magnified image of the fundus is seen when the mirror alone is employed, but practically it is at too great a distance from the observer to be useful.

To set up the instrument for use it is only necessary to bring the centre of the lens and mirror into the horizontal plane with the eye of the patient, then let a patch of light about the size of the eye fall upon the cornea. The focus is very nearly correct when a small image of the central opening in the mirror is seen brightly depicted in the spot of light on the eye. The long handle which is attached to the tube carrying the lenses is used to bring the fundus to the most perfect focal adjustment. The arrangement of the several parts of the instrument is shown in the accompanying woodcut, with the relative distances tolerably well preserved. The mirror, of 18 inches (English), or 46 centimetres, focus, which has the usual central perforation, is hung in a gimbal by screws, and can be turned in any direction. It should be placed about 40 inches from the eye under examination. The patient is represented seated at *a*, with his chin firmly supported in a convenient concave rest, the foot of which is secured to the table. The lenses, mirror, and chin-rest are each fitted in upright adjustable draw-tubes, with screw clamps, for fixing at any required height. The eye of the patient should be turned slightly away from the bright spot of light, and kept directed towards some fixed object. A moveable disc with a bold letter or two printed upon it (represented at *e*) will be found most convenient for the purpose. This assists, also, in keeping the optic disc in the centre of the field during the examination. The best illumination is obtained by employing an ordinary Oxford reading-lamp, and this must be placed at a convenient angular distance within the focus of the mirror, and either to the right or left of the observer. A small cardboard screen protects the eye from the diffused light emitted by the lamp, as represented in the woodcut.

The image obtained by the aid of this instrument is the counterpart of that seen when the hand-ophthalmoscope is used; and the ease with which it can be adjusted and the fundus kept in view is, I consider not only an advantage but a saving of time. A few seconds will serve to put the instrument in position, and the merest tyro, equally with the experienced observer, will have no difficulty in using it. No specially darkened room is needed; the ordinary consulting-room, with the blind drawn down, is sufficiently dark for a demonstration.

On Certain Forms of Atrophy of the Optic Nerve.

By Jabez Hogg, *Surgeon to the Royal Westminster Ophthalmic Hospital, &c.*

Certain forms of disease, tending to terminate in atrophy of the optic nerve, are amenable to treatment, while many other similar morbid changes still defy all our *auxilia medica*. I believe, however, that it will be found ultimately quite possible to attempt more than we have hitherto attempted for the relief or cure of a greater number of these cases. For this reason I propose to submit for the consideration of the Congress the question of atrophy of the optic nerve. The atrophic state is seen to have many modes of invasion, but as the question is a large one, and as the time allotted to my paper will not permit of my entering fully into it, I must content myself by making a few observations on atrophy arising out of intra-cranial inflammatory or congestive causes, and in which, with the ophthalmoscope, a neuritis, or other morbid condition of the disc and retina, is observed. Atrophy arising out of certain intra-cranial diseases passes through at least three well-marked stages: first, an inflammatory or congestive stage, associated with changes in the optic nerve; secondly, an exudative or proliferative stage, when the capillaries are loaded and disposed to break up, and when the whole optic nervous apparatus, including the retinal vessels, is seriously implicated; and lastly, an atrophic stage, when complete obstruction of the vessels interferes with and arrests nutrition, the visual field is very limited, and absorption to a considerable extent has taken place, and the optic disc is of a pearly white colour. As the disease approaches towards the final stage some writers insist upon a further division into "simple or progressive," and "consecutive atrophy"; in the former of which the vessels are small and irregular, and the periphery of the optic disc evenly and cleanly cut out, and of a brilliant white colour, while in the latter the vessels are blurred and the greater part of the optic disc is concealed, "choked," and its outline very irregular; wasting degeneration of the nerve has partially or wholly destroyed central vision. I am not so thoroughly convinced that the final stage can be divided with practical advantage; nevertheless the one great fact remains, that if the disease once passes the inflammatory or congestive stage remedies are of little avail, and will not arrest further degeneration and destruction. As an apt illustration, one, no doubt, familiar enough to those I am addressing, I may mention the case of J. W., a lad of seventeen years of age, who, when I saw him, had suffered for ten days from a meningitis. The discs presented the appearance of a simple or progressive atrophy. The disease had then already passed from the inflammatory stage to that

of complete atrophic degeneration. I need scarcely say that in this case the patient became hopelessly blind.

It has been asserted, and, upon competent authority, that it is not an uncommon thing to meet with patients even in this stage, "with white and even glistening discs," able to read ordinary test types "with ease." This is, I think, either a mistake or the patients must have been suffering from a form of atrophy quite apart from cerebral causes.

The atrophic morbid change, of which I more particularly wish to speak, is one, so far as I know, which has not received attention from ophthalmological writers, and possibly from the circumstance that, although quickly terminating in atrophy, it is not, so far as I make out, preceded by an inflammatory stage. If reliance can be placed upon the statements of patients, the accession of the disease is neither marked by pain nor other premonitory symptoms which could lead them to suppose blindness was likely to supervene; nevertheless, it not unfrequently happens the sight of one eye has been lost before the surgeon is consulted.

Whatever the nature of the disease, it occurs quite as often in females as in males, and at a comparatively early period of life, without previous history of anæmia from hæmorrhages, from heart-disease, syphilitic or albuminuric degeneration, pigmentary retinitis, or posterior staphyloma, or over indulgence in alcohol or tobacco.

If the history of patients so afflicted be followed up, and on whom our limited therapeutical knowledge has been exhausted, it is found that they are fully equal to all the ordinary affairs of life, and enjoy a fair amount of good health. This circumstance may be taken as indirect evidence that the destruction of sight was not in the first instance due to intra-cranial mischief. The origin of the disease can only be ascertained by post-mortem examination. But such examinations are almost beyond the reach of most English ophthalmic surgeons. I will briefly allude to a typical case of the kind. A fine grown young woman, S. W., twenty years of age, came under my care a few months ago. She then had only a faint perception of light. The discs presented the appearance of "consecutive atrophy," and were blurred and irregular. In this condition they remained during the four months and upwards she was under treatment. An entire absence of a previous history of anything approaching to an inflammatory origin in the membranes of the brain or internal eye is a principal feature in the case. She had enjoyed excellent health, and only complained once of headache, and that came on after a month's trial of the hypodermic injection of strychnia. Veratria and other remedies were subsequently tried, but without the slightest benefit.

I could easily furnish particulars of a large number of such

cases, but will content myself by giving a few particulars of another case, as it presented some remarkable appearances. Henrietta W., æt. twenty, came under my care complaining of the loss of the sight of the right eye. She had always enjoyed good health, and good sight, and never had any symptom of heart-disease, or of kidney mischief, and until a few months since the sight of both eyes was quite perfect. This statement was confirmed by members of her family. Nevertheless when examined with the ophthalmoscope the right optic nerve was seen to be in an advanced state of atrophy. At the present time the disc is quite lost in a white flocculent mass, vessels can no longer be traced, one rather enlarged covers what may be taken to be the papilla. The eye is totally blind. It has been supposed by some who have carefully examined the eye that the sheath of Schwann is retained, but this is scarcely consistent with the previous history of good vision. I have therefore associated it with those passing rapidly through an early stage and without marked premonitory symptoms* to œdema or dropsy of the optic nerve and retina. Believing that such cases might be benefited by the hypodermic injection of solutions of strychnia, I, in the first instance, resorted to this drug in gradually increasing doses up to $\frac{1}{6}$ of a grain in each daily injection; but in no single instance have I seen any change for the better. In eleven cases I had the injections persistently tried for several weeks, but without benefit in any single instance. On some occasions by increasing the strength of the solution a good deal of cutaneous trouble followed as well as violent headache, &c. Phosphoric acid and tonics altogether failed in my hands. To the question, to what diseased condition can this special form of atrophy be attributed; where the seat of mischief? I am quite unable to offer a reply; but if I may speculate, I should say it possibly arises from either spasmodic contraction of the vessels, from blood stasis, or from fatty degeneration of the muscular coat of the vessels and nerve tubules. Impeded blood supply from any cause arrests nutrition and produces degeneration—in other words, atrophy of the various tissues. The correlation of this is seen in the gradual shrinking of the tail of the tadpole during its metamorphosis into the frog. The blood during this period of change not only becomes paler in colour, but one current after another is arrested, and the tail shrinks or is absorbed. Once

* In a case of tubercular meningitis which came under my care, and in which optic neuritis with œdema of the papilla preceded the atrophy, the sheath of the optic nerves was found in a dropsical condition after death; but as this might have been a post-mortem change, it is doubtful whether anything could have been done for the relief of the patient by tapping.

more, the atrophy may originate in a patch of inflammation in the course of the nerve behind the eye, that severs the nerve-fibres and leaves the separated parts to wither and die. The inflammatory process might then be either rapid, acute, or slow and protracted, chronic; and from absence of local pain fail to attract the attention either of the patient or medical practitioner.

On a Convenient Method of Applying Cold and Elastic Pressure to the Eye.

By W. Spencer Watson, F.R.C.S. Eng., and B.M. Lond.

The only methods hitherto used for the application of cold being attended with certain inconveniences, it occurred to me to try the ordinary toy air-ball filled with water and cooled by placing it in ice. I found that if the air-ball were distended by about double the quantity of water required and then reduced in size by letting off half the contained water, we obtained a soft cold compress which answered very well.

The air-ball filled with air instead of water answers equally well as a simple compress when it is not desirable to employ cold.

The cases in which I have employed these balls for the purpose of applying cold have been principally cases of traumatic keratitis and cases of inflammation of the eyeball after injuries or surgical operations.

They are easily applied, and can be kept in position by means of an open network bandage.

On the Treatment of Blennorrhœa of the Lachrymal Sac by the Injection of Villatte's Fluid.*

By Dr. Ozio, *of Barcelona.*

Since the brilliant idea of Bowman, the treatment of the diseases of the lachrymal passages has become perfectly scientific. Formerly operations of this kind were essentially practical, their anatomical and physiological bearings being unheeded. The operation of Dupuytren, which enjoyed great favour in cases of lachrymal fistulæ, thanks to the reputation of its distinguished originator at the Hôtel Dieu, has become a matter of history. The very ancient plan of cauterizing the sac,

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* The composition of Villatte's Fluid is as follows :—

℞ Liquor plumbi subacetatis, 120 parts
Zinci sulphatis . . . . 60 „
Cupri sulphatis . . . . 60 „
Aceti . . . . . 800 „ Ft. mist.

though attempts have been made to revive it, should be buried in oblivion; indeed it is a matter for surprise that even at the present day it should find advocates who still argue in favour of such a relic of antiquity. As far as Bowman's method is concerned, it must be confessed that though it so much alleviates the symptoms of blennorrhœa of the sac, such as epiphora, lachrymal conjunctivitis, &c., yet the cure is not complete, even after the treatment has been continued for some length of time. Even after adding to the use of the probe that of injections by means of Weeker's or Galezowski's perforated sounds, and the various substances suggested for this purpose, I have never yet had the good fortune to obtain an entirely satisfactory result; and though I cannot boast at my age of a very long experience, yet on the other hand diseases of the lachrymal passages are so frequent in Barcelona that the cases of this kind which come under my hands may be numbered by hundreds, and I may add that I have had patients who with a heroism worthy of a better cause, as a general once said, have undergone the treatment for more than a year. When I read—in the *Annales d'Oculistique* for 1868, I think—the plan of M. Stilling, of Cassel, so highly spoken of by one of the most accomplished and conscientious oculists, M. Warlomont, I at once gave it a trial, and I am free to confess that in slight cases with simple epiphora, the result at first is admirable, but no subsequent progress towards a cure is made. The greater number of the cases which I see consist of lachrymal swellings, accompanied by long-standing blennorrhœa, in which pain is caused by pressure over the region of the sac, and by the same act of pressing a thick fluid like mucilage of gum-arabic is evacuated.

What, then, is the cause of this obstinacy of the disease in resisting all remedies which have as yet been tried, not excepting injections of tincture of iodine?—which, I may remark, is sometimes of use in slight cases where the morbid change is confined to the mucous membrane of the sac and canal. According to my experience, it is in consequence of the fact that in long-standing cases, which form by far the most numerous class, the patients do not seek advice until too long a time has elapsed since the commencement of the disease. It is in consequence of this, I say, that inflammation and caries of the osseous structure occur. Of this fact I have no doubt, for I have seen numbers of instances of its occurrence, especially in strumous subjects; and it is well known with what frequency and with what facility morbid changes occur in such individuals. Well, under these circumstances, bearing in mind the enthusiasm with which M. Nélaton spoke of Villatte's fluid and the good results I had seen in cases of carious bone in his clinique, I decided to inject

some of the said fluid into the suppurating sac. My success was equal to my hopes, especially in cases of extensive caries, which are easy of diagnosis, since the probe passes in several directions, and a sensation is felt as though the probe were being rubbed upon parchment.

I do not pretend to have exhausted this subject, but I believe that it is not in the use of this or that instrument, or even this or that operation, that we must look for a complete cure in blennorrhœa of the sac; on the contrary, to attain that object we must seek for remedies wherever we can find them, and I believe that the remedy which I propose actually possesses the property of modifying more than any other the condition of the mucous membrane, and in a much higher degree still the osseous canals which enclose the excretory passages of the tears. The plan of injection which I adopt is very simple: after having passed a probe through the upper or the lower lachrymal canaliculus, I introduce one of the two canular sounds before mentioned, and inject the undiluted fluid. As a rule the proceeding is followed by very little irritation, which is easily subdued, and, after some few injections, decided changes are soon noticed, and a cure results.

Saturday, August 3.—*Afternoon Sitting.*

M. DONDERS IN THE CHAIR.

On Transplantation of the Cornea.

By Henry Power, F.R.C.S., M.B. Lond., *Senior Ophthalmic Surgeon at St. Bartholomew's Hospital.*

A large number of cases present themselves at every ophthalmic hospital in which, whilst the cornea is almost as opaque as the sclera, the retina retains its sensitiveness sufficiently to permit the patient to discriminate light from darkness, and even the passage of the hand or other large object between the eye and a window. In some of these cases the whole globe is enlarged and filled with a watery fluid; in others the cornea is staphylomatous and immensely thickened, and but little hope can be entertained that any kind of operation will effect a restoration of sight. There are other cases, however, in which the eye preserves its natural size, form, and tension, and, as shown by pathological investigation, the humours their natural consistence and transparency; and it would appear that the only thing required to restore a useful amount of vision is to make a window, through which light may gain entrance to the interior of the globe. Accordingly we find that, with this object in view, an immense variety of methods have been suggested, in the hope that the corneal tissue might be restored to its original transparency. Stimulants of all kinds, both solid and liquid, scarifications, abrasion of the surface, removal of thin lamellæ, have all been tried, and no doubt, in many instances, where the pathological alterations of the corneal tissue have not been too profound, with considerable success. Where, however, the opacity is complete, and the cornea has assumed the appearance and almost the structure of a tendon, the patient is usually at once told that no improvement can be looked for from surgical interference, and that he must bear his affliction with resignation.

It is somewhat surprising that the suggestion for the performance of a plastic operation for the relief of the more favourable class of cases to which I have above alluded should have been of comparatively recent date, if Himly be correct in stating that he was the first to propose in his

lectures,* delivered in 1813, that the cornea of an animal might be transplanted into the eye of another without more than a partial loss of transparency.

In our English works the most casual references only are to be found in regard to such a proceeding. Mackenzie † dismisses the whole subject in a line or two, declaring that all such attempts have failed; whilst Middlemore, Guthrie, Tyrrell, and Lawrence make, I think, no allusion to it at all.

I was much surprised, however, in finding, on following up a reference in Desmarres's treatise,‡ some time after I had commenced my own experiments, that a considerable literature existed upon the subject in the German periodicals, ranging from 1823 to 1844, after which it seems that but little, if any, attention has been paid to the subject.

The first case which led me to think that transplantation of the cornea was possible was that of a patient suffering from glaucomatous symptoms in an eye that had long been blind. With a view of relieving the pain and tension I punched out a large portion of the cornea, and immediately re-applied the part excised. In the course of three or four days complete union had taken place; the piece excised had, however, become very hazy, though not absolutely opaque. The pain continuing unabated, the eye was removed at the end of a week. In effecting this the transplanted portion separated through the greater part of its extent, but it was not the less evident that it had been thoroughly united.

I next proceeded to operate on three dogs, but these operations all failed owing to the animals stroking the injured part with their fore-paws. The instrument used was a sharpened brass Mohr's corkborer, and, owing to the absence of proper fixing apparatus, considerable damage was done to the cornea and subjacent tissues, and I was not surprised at my want of success. On mentioning the subject to my friend Dr. Klein, he very kindly offered to place the advantages and conveniences of the Brown Institute at my disposal, and to give me his valuable aid in performing the experiments. These had for their object, first, to determine whether a cornea after excision would, on being replaced in the same animal, become attached and preserve its transparency; secondly, whether an excised cornea could be removed from one animal to another of the same species; and thirdly, whether the cornea could be similarly transplanted from one animal to another of a different species.

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* "Krankheiten und Missbild. des menschl. Auges," Heiberg, Berlin, 1843, vol. ii. p. 60.

† "Treatise on Diseases of the Eye," p. 882. ‡ "Maladies des Yeux," t. ii. p. 339.

I requested Mr. Weiss to make for me a series of extremely sharp steel punches, of which one three-eighths of an inch in diameter was found in practice the most convenient. The animals—rabbits and cats—were rendered completely insensible with chloroform, and were then fixed in a Czermak's rabbit-holder. The lids were separated with a speculum, and the punch being carefully applied, was firmly pressed and rotated. The punch usually cut through one-half or two-thirds of the circle, and the complete excision was effected by means of scissors, taking care to touch the portion to be removed as little as possible. The lens was then carefully extracted, and the cornea was simply replaced, or another animal was similarly operated on, and the corneæ were then exchanged. No sutures were employed, as it was found to be impossible to pass even the sharpest needle without doing much injury to the membrane, whilst I thought the sutures were sure to set up inflammation. Moreover, it was found that neither the hole nor the piece of cornea excised enlarged or contracted in any way, the two fitting exactly, and the excised circle could, therefore, be neatly inserted. In the case of rabbits the membrana nictitans was drawn over the eye, and attached by a suture to the outer canthus of the lids. Where this was neglected the inner half of the cornea was always found, owing to the friction of this membrane, to be very opaque and the union imperfect. The lids were always sewn together. No attempt was made to examine the eyes until after the lapse of a week. It was then usually found that they were hermetically sealed by blood and inspissated pus and lachrymal secretion. Upon dividing the sutures and separating the lids there was a considerable quantity of whitish muco-purulent secretion. Upon removing this, the cornea, when the experiment was successful, was observed to be adherent, and generally of a pearly tint. On several occasions they were sewn up again, but in no instance did the animals live long enough to allow the cornea to regain its transparency perfectly, death occurring apparently from pyæmia; the opacity of the cornea, however, did not exceed that which is often seen in cases of severe keratitis, and which eventually clears up sufficiently to permit large objects to be seen.

I am again indebted to Dr. Klein for having made some beautiful sections, which I here present to the society. It will be seen that the union is perfect, the line of junction being scarcely distinguishable in the proper corneal tissue, and not at all in the epithelium; that the excised and transplanted circle of cornea is greatly increased in thickness, presenting with low powers, a uniformly granular aspect, the granules being resolvable with higher powers, into cells, which are partly corneal corpuscles, and partly pus or young cells. Vessels may be seen passing from

the original into the transplanted cornea. In the latter the laminated character of the tissue has almost entirely vanished, by no means, however, presenting such a character as to lead any one familiar with ophthalmic diseases to consider the recovery of transparency a hopeless affair.

In a note just received from Dr. Klein he kindly gives me the result of his examination of the specimens, and states that the following points are noticeable :—

1. That the epithelium which covers the excised portion of cornea passes without any noticeable interruption from the excised to the unexcised portion of the cornea. The thickness of the epithelial layer, however, diminishes towards the centre of the excised portion.

2. Owing to the presence of projecting vascular arches or loops, running from the deeper parts of the corneal tissue towards the epithelium, both in the outer portion of the excised cornea and in the inner circle of the non-excised cornea, the line of junction of the epithelium with the corneal tissue is not a plane surface, but presents more or less regularly arranged loops, conferring on the surface of the corneal tissue the appearance of being beset with vascular papillæ. To this last circumstance it may be due that the deeper portion of the epithelium grows in the form of cones composed of young epithelial cells.

3. In reference to the corneal tissue itself the most superficial layers are quite continuous in the two parts, both as regards the connective tissue fasciculi and the intermediate cell-rows and bloodvessels. The layers immediately beneath the epithelium in the externally situated parts of the peripheral non-excised cornea and in the internally situated parts of the central excised cornea are richest in young cells—pus cells.

4. This is also the case in regard to the deeper layers of the cornea at the part where the line of union is most distinctly marked, especially in the excised portion of the cornea. Hence the parts of the excised piece adjoining the line of union are more transparent than the corresponding part of the non-excised portion, and the corneal corpuscles are more normal in appearance here than elsewhere. At the same time there are many parts of both the excised and non-excised parts of the cornea, in which the corneal corpuscles appear natural when not concealed by young cells.

5. The tissue rich in young cells, pus cells and bloodvessels—adjoining the line of union of both the excised and non-excised part of the cornea unites very firmly the tissue lying between the fasciculi of the cornea forming one continous mass.

Since commencing these experiments I have had only two, and these very indifferent opportunities, of trying transplantation on the human

subject. Such as they are, however, I venture to bring them before the Congress, and believe they will be considered to afford good hope that under favourable conditions this operation might be attended with success.

Both cases were cases of extensive staphylomatous protrusion of the cornea occurring in children, as a result of purulent ophthalmia. In both the cornea was of very remarkable thickness, not less perhaps than an eighth of an inch. The boring process was easily performed under chloroform, and a fresh piece of rabbit's cornea of corresponding size introduced; in both cases union occurred by first intuition without sutures, without any irritation, inflammation, or suppuration whatever. In one case the cornea has become opaque, in the other it remains tolerably clear.

In conclusion, then, I have experimented on three dogs, three cats, four rabbits, and two human beings. The dogs and cats failed, but probably owing to want of proper precaution and experience in performing the operation. In the rabbits union occurred in every instance, though the cornea always became pearly white. Only one of these animals, operated on six weeks ago, has lived; in this animal the cornea is still attached, elevated and pearly white. In the experiments on the human subjects the excised portion of cornea being replaced, in one instance grew and remained semi-transparent for a week; whilst in the other two cases the cornea of the rabbit being inserted became attached but lost their transparency.

New Mode of Introducing Sutures into the Cornea.

By G. D. Williams, *of Boston.*

I want to show a method of placing sutures in the cornea which I have employed with great success. It may be applied to whatever operation is selected, and in my judgment it offers considerable advantages over several of the modes of operating in preventing procidentia iridis and anterior synechia by favouring the more immediate union of the corneal wound, and thus avoiding some of the principal dangers of cataract operations. The needle which is used is an extremely small one, and has to be held by forceps, roughened, which are better than any needle-holder that has a snap in releasing the needle, because of the importance of having no traction upon the cornea whatever. I seize the point of the flap with an iridectomy forceps, and then, passing the needle through the flap, through the superficial layers of the cornea, and then, having placed the suture in the corneal flap, I introduce the

needle through the opposite edge of the wound, and tie it, using a very fine thread.

In answer to Mr. Critchett, Dr. Williams said that he used ether, not chloroform. It was very desirable that complete anæsthesia should be produced.

Observations on Various Practical Points of Ophthalmology.

By Mr. Bowman.

I am unwilling that the Congress should assemble in London without having an opportunity of saying a few words, and, if the President will allow me, I will advert to a few points of practice in the order in which they occur to me.

Enlargement of the Pupil by Incision of the Pupillary Fibres from Behind Forwards.—There is, first, an operation which has some novelty in the manner in which it is performed—an operation for artificial pupil, or for enlarging the pupil. We all know that it is exceedingly important, in certain cases, to make the pupil in one particular part, and to limit it precisely as far as possible. In cases of lamellar cataract, for example, in which the cataract is very small, and in which there is a considerable marginal part of the lens quite clear, the operation for enlarging the pupil outwards, so as to allow the light to pass through this clear portion, is one that has been performed in various ways, which I need not enumerate. I will merely state that it occurred to me in one case of conical cornea, in which the lens was clear, to operate by a method which, so far as I know, is novel. I had previously done a double iridodesis. The resulting vertical pupil, when the light met the eye, was simply and absolutely linear, and on looking at the eye at a very little distance, the iris only could be seen, with no pupil at all. If the patient turned away from the light, it opened out into a slightly elliptical form. The conicity remained, with such an amount of sight as the conicity through this imperfect pupil would allow. I had performed the double iridodesis several years ago, when I first proposed to apply Mr. Critchett's operation to cases of conical cornea. This patient came up last year, and I then saw the desirableness of operating on the apex of the cornea according to the method proposed by Von Graefe. I operated, and after a time I got a slight reduction of the apex of the cone, but there remained the perfectly linear and exceedingly restricted pupil, and it was desirable to open that. I did not know how to effect this, but it occurred to me that I might do it in this way:—I took one of these ordinary canalicular

knives, with a blunt point and cutting edge, and having previously prepared a way by a broad needle, I introduced it, penetrating the chamber as far as the pupil, then through the pupil, at right angles to it, and turning the edge forward, cut the iris to the extent desired, in withdrawing the knife, against the cornea, the aqueous having then escaped. The result was a very satisfactory pupil.

Then it occurred to me that this method might also be adapted to cases of nuclear cataract, and I have had a little knife made. I do not know whether it is better than the original one. I think a more delicate one might be made. I have used it in precisely the same way, introducing it through an opening made in the horizontal meridian. I presume it will usually be in that direction that the knife will be introduced, although it might be introduced in any direction, according to circumstances. I have an opportunity of showing to-day a little boy on whom I performed the operation last Monday week. No irritation followed in either eye, and in both a fair pupil has resulted. The nuclear cataract is rather small; the margin of the lens is perfectly transparent, and the pupil is somewhat pear-shaped. The circular muscle of the pupil, being simply divided at one point, still acts a good deal in the rest of its extent, and keeps the central part of the pupil small. His vision is, of course, greatly improved, being the same as before, under atropine. He is myopic to about one-eighth, and that being corrected, his vision amounts to one-half for distant objects. He can read No. 1 Jaeger with each eye at a fair distance.

I may state that in cutting the iris forwards against the cornea, I not only cut the iris, but I slightly nicked the cornea. There is resulting a very faint opacity where the edge of the knife cut it. I do not, however, think it is of the slightest importance, and it will probably disappear. I do not think there is any fear that in such an operation the knife would be drawn with such force against the cornea as to penetrate it, or inflict a permanent scar.

I shall say nothing about the advantages of a pupil in that situation, except that it is of course desirable to keep it from the margin of the cornea, and as central as we can. I do not intend to recommend this operation in all cases, but merely tell you what I have done under such circumstances as I have related.

Excision of the Pupillary Structures.—There is a mode of operating, which I am not aware has ever been published, in cases in which we wish to cut away the central structures in the pupil, dense false membranes, &c.; or when we wish to extract a cataract where there is a membrane on the capsule, and when it is desirable to avoid that upward

traction of the pupil towards the section which is apt to occur when such false membranes exist. The inflammation following the operation is apt to occasion new deposits on the old, with so much retraction afterwards, that eventually we find the pupil closed and at the margin of the cornea. Where that may be anticipated I introduce the ordinary iridectomy knife, running its point through the iris into the surface of the lens. Then I introduce the sharp point of a little pair of scissors through the opening made in the iris, and the blunt point of the other blade in front of the iris and behind the cornea, on one side of the pupil, and then, bringing them together, I divide everything between them. The same thing is done at the other side of the pupil. These two incisions meet at their apex. Then this portion of the iris, including all the pupil, is withdrawn by forceps, and, we suppose, also with it some of the lenticular substance. Then the cataract comes away, and we have only the posterior capsule and a marginal part of the iris left. The future chance of such a patient getting good sight from a single operation is better than if such a proceeding had not been done. I have done this for several years, and occasionally the result has been very satisfactory.

That led me to treat in a somewhat similar fashion the cases in which there is a dense false membrane after iritis (the lens perhaps having to be removed) which with great difficulty yields to the knife. It is rather desirable to get it away by cutting round it with scissors. We may take up a triangular portion in the same way, but in order to get away as large a portion as possible I have followed another plan, either with two triangular knives or with a stop iridectomy knife, the stop being near the base, so as to check its advance beyond a certain point. With one of these in one hand, and an ordinary knife in the other, we make a double opening simultaneously on opposite sides of the cornea. It is more convenient of course to make these two openings on opposite sides of the cornea in a horizontal than in a vertical direction. I then run a pair of scissors in two diverging lines from each incision, in the same way as before, thus enclosing between the incisions a large square or rhomboidal portion of the irideal region including the pupil, and all the structures there. You then withdraw the portion thus cut out. There is no drag on the ciliary region: whatever is withdrawn has been cut away from its connexions beforehand.

In these cases we are often obliged to operate with a very small chance of success. In many the false membrane forms again in front of the vitreous humour. Still we have done what we can, and in a certain number of such cases we have a satisfactory result.

This stop iridectomy knife I have used for cases of glaucoma. We

are all inclined in certain cases to make as large an iridectomy as we can. It is possible to remove the whole iris. I have done it myself several times, and I think it not a bad operation sometimes. The method I generally pursue in glaucoma is to introduce the forceps at each angle of the incision, and to seize the iris beyond its limits so as to make a larger iridectomy than incision. Even so it is sometimes desirable, it seems to me, in order to obtain the fullest effect, to make a double iridectomy on the two sides at once. I do not know whether Graefe was the first to do so, but all, I suppose, have made a second iridectomy on the recurrence of glaucomatous symptoms in an eye in which iridectomy has succeeded for a time only. It occurred to me that when you anticipate that the glaucomatous state will probably return after an interval, we might, by a single operation, avoid the necessity of a second, by taking out at once a piece of iris on the opposite side, in the direction of any diameter selected. But there was a difficulty. The difficulty was, having made the first iridectomy, and the aqueous having escaped, in introducing the knife on the opposite side without wounding the lens. It occurred to me that we might, by using two separate knives at the same moment, before the aqueous escapes, avoid the difficulty. I have often done so, and am not aware that I have ever wounded the lens. The stop knife is introduced first and then the ordinary knife. While the eye is held by the stop knife sufficiently firm the other is introduced. It is only necessary to keep the attention directed to the points of the two knives at the same moment, and to keep the points a little forwards while entering.

Conical Cornea.—This is the day of operations on the apex of the cone. It is not long since the operation was always on the iris, and we did not venture to deal with the apex of the cone. When I heard of Von Graefe's method of operating on the apex, I performed it in some cases and with some degree of satisfactory result as regards the diminution of the conicity and increase of vision, but it appeared to me that the application of caustic was attended with a good deal of irritation, continued and repeated irritation, lasting for two or three months in some cases, and it was a distressing process for the patient and for the surgeon. Another inconvenience that seemed to me to attend it was that we had not, by that method, the means that we might wish for of limiting the area of the operation. I think this is a very important point; it is very desirable in various cases, although it is perhaps somewhat a matter of guess how much in any one case we should remove. I do not at all despair of arriving at a time when we may form a pretty exact estimate, according to the amount of conicity, of the quantity of cornea

that should be removed, and thus we may be more easily able to treat the cases by a single operation. At present it is somewhat guesswork as to how much we should remove, and we may have to repeat the operation. It has struck me that the best instrument to use would be something in the nature of a trephine. As it seemed desirable not to entirely penetrate the cornea, it seemed necessary to limit the depth to which the cutting circle should go. I had some instruments constructed by Messrs. Weiss, some with a stop on the outside of the circle, some on the inside. I think that on the inside is much the better. Here is one that moves so that the stop can be screwed up to the cutting edge. Here are three forms. The size of the circle made is determined, of course, by the diameter of the instrument which is used. I soon found that it was desirable to go completely into the chamber and remove, as far as I could, the thickness of the cornea. I think it is a new doctrine to most that it is not so very easy to maintain a corneal opening. It has a great tendency to close. I used some of these instruments in cases in which I wished to establish a temporary fistula. I found that the opening at the end of a few days or a week closed up, if not within that time with cicatricial tissue, at any rate with thick lymph which prevented the exit of the aqueous humour, and no doubt that lymph, passing from the margin, eventually closed the opening. In one case particularly (I think it was of serpiginous ulcer of the margin of the cornea), in which every kind of treatment, including carbolic acid, failed to save the eye, I tried for several weeks to maintain an opening, and I failed. It ended by always closing. So I think we may say there is a great tendency in corneal wounds to close. This may encourage us to deal with the apex of the cornea by complete removal of a portion of the tissue. I have never seen an eye lost by it, and this could hardly be unless too large a portion was removed, so that the corneal tissue was quite insufficient to come together. I think we need not fear that the corneal wound will not unite. I have used these instruments for the apex of the cornea, and with this result: that exceedingly little irritation occurs, and in a very short time, apparently by the contraction of the corneal tissues towards the central wound, the area made by the instrument contracts and is closed within a week or at most a fortnight. It has not been necessary to use a suture. In all cases where a considerable portion has been removed the iris has come forwards and has united itself to some part of the cornea, even where the wound was made in this way, but it is only necessary then, the wound being united, to introduce a needle and tear through the adhesion. In one case I made an iridectomy at the time of the operation, making it impossible for the iris to come in contact. That had a very good effect, but still I

think I shall be rather loth to make an iridectomy because it will tend to lessen the acuteness of vision.*

I should mention, and I take great pleasure in doing so, that at Moorfields on Tuesday our colleague, Dr. de Wecker, put into my hands a little instrument which is very similar to my trephines. I would have preferred that he had mentioned it to the Congress but he requested me to do so. It is provided with a spring by which an instantaneous rotation is produced, and during the rotation there is a retiring of the cutting edge from the cut surface. The idea of using a spring, as in the artificial leech, had occurred to me, but I thought the rotation might be effected with greater nicety and precision by the hand than if we used anything like a spring. In consequence of the retiring of the cutting edge a certain pressure would have to be kept up to allow it to penetrate. I should be afraid that the pressure might cause it to go too far in and hit the lens.

There are other methods of opening the cone which I should like to enumerate. I have practised doing so by a flap, and I think it is a very nice method. I learnt it from Mr. Bader. With an ordinary Graefe's knife I make the flap on one side of the cone, and then, seizing the flap so made, I cut more or less away on the other side by a pair of scissors. In this way considerable precision of section may be given. Another method which has occurred to me is to have two little needles or cutting knives, very small, adapted to each other in a single stem so that they can be placed at any distance but may be always kept parallel. I should make with these a little incision in the vertical direction. Mr. Weiss has promised to make me such a knife, but it has not yet been made.

Another method that occurred to me is to have a pair of forceps with in each blade two sharp points so that one pair of forceps has four sharp points which could be limited so that the utmost expansion of the forceps might be governed by a scale. They would pierce through the cornea and come together through it, and in that way with a pair of scissors or knife the portion seized might be cut off. The amount removed might thus be pretty accurately defined.

Then there is the actual cautery which Mr. Bader has practised. My attention has been much drawn to this subject by the results of Mr. Bader's

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* Since the date of this communication, I have modified the operation by only penetrating with the trephine through three-fourths of the corneal tissue, and peeling off the circular portion to this depth with forceps and broad needle—afterwards only perforating the remainder with a needle in the very centre again and again at intervals, as the aqueous reaccumulated,—thus obviating the inconvenience of the anterior synechia above referred to : and this I regard as a further improvement of the method. I have thus had some excellent results and no failure.

most admirable operations. I have had some cauteries made of different sizes and shapes so that the area destroyed may be accurately defined.

In passing from this subject I may say for a moment, in conclusion, that these trephines of larger size I have used from the first period of their having been made, viz., in 1869, for the treatment of staphyloma, generally in children, following purulent ophthalmia; where a considerable bulbous staphyloma occurs, I have been gratified by the extreme harmlessness and painlessness of the treatment. The patient having been put under chloroform, with a large trephine, an eighth of an inch in diameter or even larger, a central portion is removed. In this case you push it well in. There is no lens to trouble ourselves about, or if there be, we do not mind, and the part within the trephine is removed. Afterwards there is no irritation. The child will not cry at all after the operation. In a week or two the aperture is closed up again. If then there be still a bulge we can repeat the operation, taking away really a much larger portion, although the instrument is the same, because the external parts have become drawn towards the centre. Thus these cases may be treated with great simplicity, and I can answer for it that it is a very harmless proceeding, and satisfactory in its results. No vessels can be wounded which will give any trouble.

M. Meyer: I believe that in order to cure keratoconus it is necessary to remove a part of the cornea in its entire thickness, and I am of opinion that this may be done quicker and more safely by the method of Graefe than by that we have heard described. The method of Mr. Bowman, as has been just observed, renders the occurrence of an anterior synechia of the pupillary border probable; and there is also perhaps some danger of injuring the anterior capsule, the central part of which is in direct contact with the wound, and the lymph which fills the same. The irritation of the eye, from the cauterization, which Mr. Bowman fears, and which is an essential part of the method of Graefe, I have in the eight cases on which he operated had no opportunity of observing. I believe it may be avoided if the cauterization be carefully conducted; and if the disposition of the eye to reaction be centralized in each case, by means of salt-water; and the eye kept under the influence of atropine, and closed by a light pressure-bandage.

Dr. de Wecker: My instrument is for another purpose. I use it to make a fistula in a cicatrix, which is usually very thick, and opposes considerable resistance. I think it has the advantage that it can be stopped, and so the escape of the aqueous

humour may be prevented. It acts very well, and cuts very nicely out. I should be glad if Mr. Bowman would accept the instrument and use it.

Mr. Bowman replied that he should be happy to accept it for the Moorfields' Hospital.

Dr. Noyes: I have a few words to say in connexion with what I said yesterday, concerning muscular asthenopia and its complications. I have here some of the printed forms for case-taking to which I alluded. I have further to call attention to a couple of glasses in which cylindrical surfaces have been ground upon the thick glasses necessary for cataract cases, without the necessity for cementing. They are made by an optician in New York. Further, the same optician has accomplished another object. For patients whose eyes are sensitive to light, and for whom blue glasses are desirable, a small spherical glass of required focus is cemented upon a pale blue glass disc. The two are ordinarily inseparable, and the spherical glass, although small, serves all the purposes of direct vision. This combination serves for many cases where the patients are sensitive to daylight, and find a blue tint desirable, which it is difficult to get in a thick glass, because the colour at the centre is deeper than the colour at the margin.

M. Warlomont: I have already stated that M. Donders has a communication to make. Three hours and a half have passed, and our meeting must soon come to a close. It is necessary that we should at once ask M. Donders to give us his account.

M. Donders: Allow me to detain you a few minutes. M. Warlomont will be good enough to take the chair.

M. WARLOMONT IN THE CHAIR.

M. Donders exhibited an instrument destined to measure the depth of the anterior chamber and the curvature of the cornea. It consists of a small, easily moveable microscope, the extent of the movement of which can be accurately determined by an index playing on an arc with divisions. To facilitate the focussing of the instrument upon the anterior surface of the cornea a little finely powdered calomel is dusted upon the cornea. A particle of this is now focussed, and immediately afterwards the margin of the iris. The extent of movement indicated by the instrument is equal to the apparent distance of the anterior surface of the cornea

from the anterior surface of the lens, the thickness of the iris being compensated by the prominent lens. The depth of the anterior chamber of the eye measured in this manner is smaller than has hitherto been supposed. For the purpose of measuring the curvature of the cornea a small plane mirror is required (attached to the middle of the object lens) in addition, which reflects the light of a flame into the eye of a person under examination. If the light be placed at a sufficient distance it may be admitted that its image in the mirror projected from the cornea occurs nearly at the half distance of the radius of its curvature. If the distance of the anterior corneal surface from the reflected image of the cornea in the mirror be thus measured the length of the focal distance is obtained, which, multiplied by two, gives the radius of the corneal curvature. The right place is secured to the eye by seeing the reflected flame in the *middle* of the very small mirror. Looking now at the reflected light, the eye is accommodated for distance. Looking at a black point in the middle of the mirror, it is accommodated for that distance, and in both conditions the depth of the anterior chamber can alternately be measured.

M. Donders again, in reference to the publication of Förster ("Klin. Monatsblätter f. Augenheilk.," Band x. p. 39), returned to the subject of accommodation in aphakia, and reminded his hearers of the methods by which the tests taken by himself were obtained. M. Donders holds the absence of all power of accommodation in aphakia to be established by these tests, and observed that the statements lately made calling that fact in question were obtained by no better method, as that of Ramsden and Sir Everard Home, which was proved to be quite unsatisfactory already by Thomas Young.

M. Donders then mentioned some researches that had been made in his laboratory by Dr. Talma, supplying sufficient proof that the fixed corpuscles of the cornea do not take any direct part in suppurative processes occurring in the cornea itself. By the addition of a 7 to 10 per cent. solution of sugar, the difference between the fixed and wandering cells can be established with sufficient certainty.

M. Wecker: It is my pleasant duty to return our warmest thanks for the reception we have met with here. I will not enter into details. (Applause.)

M. Donders: The time has now arrived, gentlemen, that the

Congress has finished its work. Let us hope that we have all profited, and that it has proved to the honour of science. I beg to offer to you my sincere thanks for the support you have given me, for the patience and attention with which you have listened to me, and the proofs of affection you have shown me. I do not doubt but that all those who are able to do so will accept the cordial invitation to America that has been given to us. We must not omit to thank our English friends, whose hospitality is proverbial. Finally, we must express our acknowledgments to the College of Physicians for the liberal manner in which they have assisted the meetings of our Congress. With all my heart I say *au revoir*.

Allow me to inform you that the Secretaries will be glad to have the various memoirs placed in their hands. The transactions will be published in English, but a French translation will also appear simultaneously. The drawings will appear in accordance with the usual regulations. The rules of the Congress render it requisite that a Commission should be named, charged with the duty of making preparations for the Congress at New York. It has been suggested that the following gentlemen should form the Committee:—Dr. Agnew, Dr. Noyes, and Dr. Roosa. This was carried unanimously.

Mr. Williams, V.P.: I desire to make a few remarks in regard to the subject of the place of meeting of the next Congress; in case it should take place in America, it may be asked of me what will be the expense of the voyage, and what time will it occupy. A return ticket will be from 28*l*. to 30*l*., and that will include travelling, board, and lodging. The voyage to New York may ordinarily be made in ten days, of course dependent on wind and weather. If we meet at Newport, it is a charming place near New York. I may add that during the year 1876 we shall have grand fêtes to celebrate the centenary of our country. On the 4th of July Philadelphia and all the United States will be en fête. In addition, we have many things to show you. The Falls of Niagara are not very far from New York, and not much time would be spent in going there. California might be visited in a few days; I carry with me now the measurement of a gigantic tree (showing a roll of tape) which I saw during my travels there. We hope to have the honour of seeing you amongst us during this period; we will facilitate as much as

possible your exertions, and do all in our power to render your visit agreeable.

M. Cervera: Madrid, gentlemen, gives you an invitation for the next meeting of Congress; we have nothing but our hospitality to offer you, and that we offer with all our heart. Spain at present is in a state of revolution both political and scientific, and we would wish you to see the earnest efforts we are making for the progress of humanity. Your presence amongst us will have a civilizing influence and will assist us in regenerating the country which we cherish. I leave this question for the Congress to decide. (Applause.)

M. Warlomont: I wish to make a proposition. If this Congress decide that there shall not be a meeting on the Continent in 1876, then this year will be left for New York; but if we go to Madrid the year previously, that is to say in 1875, then we could avail ourselves of both offers.

Dr. Delgado Jugo: This is the fifth year that Spain has been passed over. I regret that it has not been chosen, for lately it has made many improvements, and at present it is progressing. Gentlemen, we do not forget that Spain has remained inactive for a long time, but she will recover herself. I repeat, with all the cordiality of the invitation before presented, that the next meeting be held at Madrid.

Mr. Williams, V.P.: We should have no reason to insist upon the arrangement which we have proposed, if it were not that the year 1876 will be one of great national importance for us, otherwise we should have no right of precedence. This is an exceptional case.

M. Donders: I wish to ask if there are any other invitations for the next Congress. It is possible that some one may choose another Capital in preference to either New York or Madrid.

M. Warlomont: Allow me to read article 7 of the rules. (*Reads.*)

M. Galezowski: I do not know if my proposition has been made before, but it appears to me that it would be as well to hold a Congress at Utrecht, it being the place of residence of our honourable President.

M. Donders: Your proposition is very flattering, but I fear that it is a thing impracticable; we have not the least pretensions to such an honour, and I dare not even think of it. My friend,

M. Doyer, will perhaps be good enough to tell you what he thinks of this proposition.

M. Doyer : Impossible.

M. Donders : We must now decide between the two Capitals alone. But we must first know if the Congress will be convened according to custom in 1876. (Show of hands.) It is accepted.

Now show of hands for New York.

„ „ Madrid.

The majority is for New York.

M. Warlomont : The Congress has decided to go to New York, but probably the number of those who go will be few. I desire therefore to propose that a Congress be held at Madrid in 1877.

M. Cervera : We bow to the decision of the Congress, but it would have been very agreeable to us, and we should have considered it as a great honour if they had chosen our Capital for the year 1880, or the year following that of New York.

M. Donders : This is an affair that had perhaps better be decided at New York in 1876, but I hope that the decision there will be in favour of Madrid.

It was thus settled that the next Session of the International Congress of Ophthalmology shall be held in the United States in 1876. The Provisional Committee charged by the Congress with its organization was then nominated, and is composed of the following gentlemen :—Mr. Agnew, Dr. Noyes, and Dr. Roosa.

The following papers were not read before the Congress :—

On the Positive Adjustment of Deviations of the Ocular Muscles.

By George Cowell, F.R.C.S., *Royal Westminster Ophthalmic Hospital.*

A ten-years' observation of the results of operations for the readjustment of the ocular muscles has suggested to me as a point worthy of inquiry whether a simultaneous division of the tendon of the antagonist muscle is not much less frequently required than is apparently supposed to be the case. The present practice has undoubtedly the merit of being an easy mode of adjusting the relative antagonism of the lateral muscles, but it is at the sacrifice of some portion of the lateral movements of the eye. I have been led to bring before this Congress the following considerations, because there appears to me to be a definite principle to guide the surgeon as to when the tendon of the antagonist muscle should be divided and when it should not, and because a careful observance of this principle has in my own hands led to a considerable success in restoring the balance essential for perfect and healthy binocular vision.

1. In the normal condition of the muscular apparatus of the eye a perfect balance exists, whereby the organ is kept under control and adapted to various degrees of convergence, without consciousness of effort on the part of its possessor.

2. Any deviation from this perfect balance sooner or later makes itself manifest.

3. The deviation from a perfect balance may be positive or negative.

4. When the deviation is caused by the shortening or increased power of a muscle, it is *positive.*

5. When the deviation depends upon loss of power produced by the paralysis, paresis, or insufficiency of a muscle, it is *negative.*

6. If a positive deviation be neglected a negative element will sooner or later be introduced, and *vice versâ.*

7. When operative interference is called for, it should take place while the deviation is still uncomplicated, and should be positive—*i.e.*, *a.* When the deviation is positive the tendon of the offending muscle should be divided. *b.* When the deviation is negative the tendon of the insufficient muscle should be brought forward.

8. To weaken an antagonist muscle in uncomplicated negative deviation from insufficiency diminishes the range of movement, and, as a negative adjustment, is as much as possible to be avoided.

9. In complicated deviations—*i.e.*, when positive and negative ele-

ments co-exist, the operative interference should be double, and carefully apportioned, so as to readjust both the positive and negative elements of the deviation.

From these considerations I would beg to deduce the following rules:—

1. In cases of insufficiency of the internal rectus the tendon of that muscle should be brought forward, and the division of the tendon of the external rectus avoided. A comparison of these two operations in my own practice is in favour of the former.

2. In cases of divergence after recent division of the tendon of the internal rectus the divided tendon should be brought forward, and the division of the tendon of the external rectus avoided. The deviation may *always* be perfectly corrected without the latter proceeding.

3. In *many* cases of long standing divergence after old division of the tendon of the internal rectus it will be necessary, on account of contraction or shortening of the external rectus—*i.e.*, superadded positive deviation, to divide its tendon, as well as bring forward the tendon of the internal rectus. But there are many cases in which the external rectus is much weakened, and possesses small power of abduction, and in which the division of its tendon will seriously diminish the movement of the eye outwards.

4. In some old and extreme cases of convergent strabismus parallelism is impossible without bringing forward the secondarily weak external rectus at the time of dividing the tendon of the internal rectus.

Some Practical Remarks upon the Determination of the Acuteness of Vision.

By Dr. J. Gayat.

In order to compare the acuteness of vision of different eyes, or of the same eye at different periods of time, that is to say, according to M. Giraud-Teulon, "the degree of sensibility possessed by the retina and the degree of transparency of the media, which are estimated as collectively," it became necessary to agree upon a standard of unity.

Professor E. Jaeger, in proposing his types, which experience has accepted with such justifiable readiness, did not construct them upon any anatomical basis, nor according to the mathematical axioms generally received since the Congress of 1862. At this time MM. Giraud-Teulon and Snellen devised and simultaneously produced, the one at Paris and the other at Utrecht, their scale of test types founded upon a principle already established in 1759 by Porterfield.

When reviewing, in the March-April number of the *Annales*

d'Oculistique, for 1872, the Report of the Sixth Annual Session of the American Ophthalmological Society, M. Giraud-Teulon devotes a considerable time to a work of Mr. Joy Jeffries, of Boston, U.S., with the title "A Series of Test Types for Measuring the Acuteness of Visions;" from the description and the explanation of the principles upon which they are constructed, the Professor concludes that the points of difference between the types of Snellen and his own being immaterial practically speaking, the results furnished by the one and the other admit very readily of comparison.

In the same number of the *Annales*, M. Giraud-Teulon quotes some extracts from a work by H. Knapp, entitled "On the want of Accuracy of the Measurements of the Visual Acuteness met with day by day, no account being taken of the Increase or Diminution in the Size of the Images by the Use of Glasses." From the results with which the application of optical formulæ have furnished him, and which he has supplied in a table appended to his work, our American colleague considers that in practice we may entirely set on one side the change brought about in the size of the retinal images due to the use of either convex or concave glasses below No. 10, or even No. 5. This conclusion, tacitly accepted by all practitioners, receives at the present time confirmation in the calculations and precise observations to which it has given rise.

In relying upon the authorities previously mentioned, we possess, it may be said, in order to measure and tabulate the acuteness of vision, several formulæ which give shelter to very grave errors. For if, on the one hand, the differences which exist between the tables of Snellen and those of Giraud-Teulon are unimportant; and if, on the other hand, the influence of corrective glasses, at least those lower than No. 10, or even No. 5—that is to say, in by far the greater number of cases—may be regarded as next to nothing; must it not be the same with a series of types in other respects complicated and not easy to be appreciated?

I wish now to speak of the quality and the amount of light which is necessary for the determination of the visual acuteness, as well as the conditions under which the patient should be placed both before and during the process of investigation. I have met with so many different methods of pro-procedure, and have noticed such serious omissions in the application of the rules laid down by authors of repute, that doubts have arisen in my mind as to the accuracy of the results so obtained. To sum up the errors connected with these, the formulæ of given numbers are inaccurate, but any one can convince himself by experiments that varying extremes in the observance of practical rules may produce errors of greater or less magnitude, amounting in some instances to one-third of the entire acute-

ness. Physiology has proved that the acuteness of vision, the faculty, that is, of seeing clearly is connected with a certain degree of intensity of light, and certain well-known conditions which will be mentioned in the course of this paper. For instance, since there exist well marked differences in the senses of taste, hearing, and of touch in different individuals, living in different climates, why may not the sense of sight also be subject to these influences, such as differences of latitude, of profession, and education? Is it not reasonable to admit that the degree of absolute intensity of light, which under some circumstances is of no importance, may occasion variations in an appreciable degree? Have the Arab, the Neapolitan, the Laplander, a retina endowed with the same degree of sensibility as an inhabitant of London or Berlin? and is there not in the same way a great difference between the miners of Wieliczka and men who guide caravans, or the inhabitants of polar regions? These examples, which may be mentioned as extreme instances, reveal facts which are met with in every day practice, giving rise no doubt to some error which at present we are unable to detect; on the other hand, the oculists of Naples, of Trieste, and Algiers have a more powerful sunlight at their disposal than their professional brethren in London and Paris, and the difference is especially notable if the comparison be made between them in opposite seasons; it would then be necessary to allude in the record of the observations to details which would overburden them, for it would be necessary to mention the state of the atmosphere, whether bright or cloudy, the time of day at which the observation is made, the aspects of the building, and the position of the letters as regards the windows of the room, otherwise the results obtained present such differences that they cannot be compared with each other, nor with those obtained in towns or in different countries. Owing to the impossibility of the surgeon in the north obtaining any artificial light of equal intensity to the light of the sun which is at the disposal of the surgeon in the south, it is necessary to agree upon some uniform standard. The universal employment of some artificial light, which admits of comparison with others and with itself at various times, appears to answer all the wants of practice and of science. Photometry is not one of the most advanced amongst the subjects of physical study, and scientific men are puzzled how to express numerically absolute quantities of light or the variations in these quantities. Mechanics have outrun them in this, but they content themselves with determinations which are almost empirical. Gas engineers in order to make comparisons between the light-giving qualities of the various materials they use, employ for this purpose one kind of English candle which is perfect as regards the quality of light it gives and as regards

its manufacture. The use of several of these, giving rise to multiple points of radiation, occasions some inconvenience, so much so that they cannot be made use of for ophthalmoscopic examination, though we may use them, as Von Graefe and others have done, to determine slight differences in the vision of patients who are amblyopic.

The employment of the different kinds of luminous gas, which are not always, however, at the disposal of all medical men, is a real step in advance, but it is necessary to take measures to secure the gas at a constant pressure, for, according as we employ it in the morning or at midday, or whether we obtain it direct from the gasometer or by means of a principal pipe, it becomes necessary, in spite of the law of equal pressure of gases, and even in consequence of that same law, to attend to the oscillations of the flame, which are as annoying during any examination with the mirror as they are defective in regard to scales of letters, being, in fact, especially troublesome in the latter case. A special kind of pipe or a reservoir adapted to this end can alone obviate these inconveniences.

By adopting these precautions with a gas of a proper nature, a burner of convenient kind, one can obtain an amount of light very superior to that of ordinary lamps, which vary in form and size, and which are supplied with different kinds of oil. Generally we can attain a very perfect result by making use of a lamp furnished with a regulating apparatus, with a wick of a given size, and fed with one of the many kinds of oil well-known in commerce. Such a lamp can always be procured even when gas is not to be had, and we can obtain from it at any hour the same degree of light, and the use of a system such as this has furnished many medical men with very exact results in the study of the cases which are met with in their consulting-rooms. The use of artificial light, then, will in part at least remedy the defects of the illumination of, or the faults of aspect of the consulting-room, an advantage which is not to be despised when it applies to private establishments, which do not enjoy the immense resources of large public institutions. We have thus two conditions determined, the quality and the amount of the light, but these do not afford, at least *per se*, the complete solution of the question. There still remain the position of the light and its method of employment to be considered.

The lamp should be placed at a convenient distance, a yard and a half or two yards away from the test types, which should always receive the light at the same angle and from the same height, and we may make use of one of those reflectors which illuminate in so brilliant a manner the entire front of our shops, while at the same time the person walking is left in the shade. This latter condition must not be overlooked in

making the determination of the visual acuity. Between an observation made upon a patient surrounded by the light which illuminates the type, and that made upon the same patient when placed in the shade, the types themselves alone being illuminated, the difference in the results in the case of a normal eye may amount to one-fourth of the total acuity, and the fact is confirmed by the use of long isolating tubes in astronomical observations. The patient under observation, before being examined by artificial light, should seek rest some minutes in an apartment the light of which is of such a kind as to facilitate the passage from the brilliant light without to the more subdued light within, or again from the less bright light of a dark room to the brighter light of the consulting-room. By neglecting to place them in these conditions we sometimes meet with patients who already are, or soon will be, subjects of blindness, owing to persistent luminous impressions. It is advisable to prevent the examinations which the patients have to undergo at the hands of students, before we have first determined the acuteness of vision. Where we have examined the eyelids of the patient by inverting them, or have exposed them to oblique light, or to an ophthalmoscopic examination before placing them opposite to the types, we lose all the advantages of the above methods, and they become in consequence less exact than the ordinary methods of procedure. The realization of the above-mentioned conditions, which have been formulated and for the most part recommended by authors of eminence, must not be looked upon as minutiæ, or as an impossibility, by the science of ophthalmology, which flatters itself upon being exact. The language of science is only conventional, and its uniformity alone makes it intelligible in all times and in all places; without it we ought to mention the conditions under which the examination of the central acuity, as well as of that of the periphery, has been made, and the test of the sensibility to colours. The two last observations are far from being identical, seeing that they have been made one by daylight and the other by the light of a lamp, and in consequence their results do not admit of comparison. I have endeavoured to realize several of these desiderata, after having seen them confirmed and supported by two masters and several colleagues, and I leave them to the appreciation of the members of the International Ophthalmological Congress.

On Cauterization of the Lachrymal Sac for Lachrymal Tumour.

By M. Quaglino, *Professor of Ophthalmology in the University of Pavia.*

At the last Congress of Paris the plan of cauterizing the interior of the lachrymal sac was not very favourably received. It was thought to be inapplicable to certain cases of enlargement or fistula of the sac, and

preference was given to the plan of dilating the passages with graduated tints after previously slitting up the canaliculi. I have practised surgery for upwards of twenty-seven years, and for fifteen I always treated fistula of the lachrymal sac by the old method, with small elastic probes (cordes à boyau), or with Scarpa's styles. The treatment by these methods, now almost forgotten, was protracted. I resolved to adopt the plan of cauterization recommended by Vannoni, and employed by various Italian and French surgeons, as by MM. Magni, Sperino, Secondi, and others. I have practised it in blennorrhœa, in hernia, and in dropsy of the sac, and when a fistula has been present, and I can vouch for the fact that I have never experienced any ill effects, and that the cure has generally been complete in a month or a little more. The cicatrix has been linear and scarcely visible; coincidently the amount of secretion has diminished and all lachrymation has ceased or has only occurred to an insignificant extent when the patient has been exposed to a cold wind. The proceeding I adopt is as follows: I make a long semilunar incision with a sharp straight knife from the convexity of the sac to the border of the orbit, and opening the sac freely insert some charpie to absorb all blood. This is a matter of great importance. On the following day the charpie is removed, and the mucous membrane of the sac can then be seen, which is always more or less diseased, thickened, lardaceous, or papilliform. The cauterization is now performed providing there is no bleeding, if there be any, I reintroduce the plug and wait till the following day. I cauterize with a piece of wood, the end of which, with a little charpie wrapped round it, has been dipped in the liquid chloride of antimony, taking especial care by dilating the wound with Manfredi's speculum to touch the upper part. When the membrane is completely whitened the cautery is withdrawn and the sac filled again with charpie. The eschar produced comes away either in fragments or as a whole after the lapse of a week or two, and sometimes the whole sac becomes detached. I have several such cases under observation. Suppuration continues to take place, the cavity gradually contracts, and at the end of about a month the wound cicatrizes, leaving only a slight redness near the inner angle of the eye. When the cauterization has been well and thoroughly done, no relapse occurs. I ought at the same time to say that I do not practise cauterization when there is a simple catarrh of the sac and there appears to be no reason for considering the mucous membrane to be degenerated. I then merely endeavour to irrigate through the puncta lachrymalia. This I effect by the introduction of graduated tents, the points of which are all as fine as that of Bowman's No. 1, in order that they may penetrate easily into the aperture. I rarely find it requisite to slit up the canaliculi, and only do so when I

am unable to make the point enter. A cure is generally effected when simple irrigation has been performed seven or eight times, but relapses are frequent, for I do not believe that obstruction of the nasal duct is always, though it is frequently, the cause of the disease. The true cause is the degeneration of the mucous membrane of the sac, which being hypertrophied obstructs the nasal duct, keeps up the sympathetic irritation of the lachrymal gland and the epiphora. Cauterization removes the cause of the disease, effects the contraction of the sac, and converts it into a canal when it is not entirely destroyed, and even if this has taken place the cavity of the bone fulfils the function of the sac. That this is really the case may be shown by touching the angle of the eye with a little sulphate of copper when the patient will soon perceive the metallic flavour in his mouth. In several cases also I have been able to penetrate into the nasal duct with sounds introduced through the lachrymal sacs. It has been feared that necrosis of the bones might result, but such an accident rarely occurs if the cauterization be made with a caustic that is limited in its action, and even when it does occur it heals, though more slowly, on the application of nitrate of silver for some time. I believe the cauterization with the chloride of antimony to be more prompt and the surest method of obtaining a radical cure. The method of dilatation suggested by Bowman has only given good results in cases of simple catarrh of the sac. In Italy again MM. Magni, Gotti, and Businelli have for some time past tried enucleation of the sac and have obtained good results, and they assure me that the detachment or extirpation of the sac has not proved a matter of difficulty when it is thickened and degenerated. This fact proves that the sac may be destroyed and yet that a radical cure may be effected: nevertheless, I regard the cauterization as at once the surest and easiest method. I may add that the practice of cauterization is adopted in almost all the hospitals of my country. I believe that the want of success that has attended the operation of cauterization in other hands is attributable to the different manner in which the sac is opened and the different cautery that has been employed. Unless a large opening be made into the sac, unless the cautery be applied the day after the operation, and if the cautery used be the nitrate of silver, as suggested by Vannoni, or some other which is too slight in its action, the cauterizing action will be insufficient; or on the other hand, if it be too violent we shall either have a relapse or necrosis will occur, and the retraction of the cicatrix will cause more or less deformity of the lower lid.

On the Hypodermic Injection of Calomel in Syphilitic Affections of the Eye.

By M. Quaglino, *Professor of Ophthalmology in the University of Pavia.*

I desire to call your attention to a new method of treatment that I have adopted for some years past in cases of syphilitic disease of the eye and which has given good results, not only in my hands but in those of my colleagues, MM. Flaver, Magni, Secondi, and Demagri. You are as well aware as I that syphilitic diseases of the eye when once fairly lighted up are followed by serious results in regard to the vision, and that if they are neglected the organ itself may suffer. In the treatment of these diseases it is always important to gain time, and this can be accomplished by the injection of calomel. I have made such injections in serious cases of iritis, of retinitis, and neuro-retinitis, the substance being thrown into the skin of the temple. In less urgent cases the injection may be made into the arm. The calomel, in quantity about 20 centigrammes,* should be suspended in a little glycerine and injected with a Pravaz' syringe into the side affected. In the course of two or three days a little abscess forms which should be allowed to enlarge till fluctuation is perceptible, when it may be opened. A few days afterwards the mortified white tissue which presents at the lips of the wound may be gently removed. I prefer the formation of an abscess in order that I may have a powerful and immediate revulsive effect; nevertheless, if the quantity of calomel have been too small it will not occur. On several occasions I have seen salivation occur which is perhaps explicable on the supposition that the calomel has undergone conversion into corrosive sublimate. When an abscess has formed, amelioration in the symptoms constantly occurs, especially in cases of specific iritis. In one case which was complicated with hypopyon, recovery actually took place in six days. I have treated many cases of neuro-retinitis, of choroiditis, and even of paralysis of the external muscles of the eye by the same method with much success. It has been observed in opposition to this that the syphilitic affection is not radically cured, which is true enough in most cases. Nevertheless, the general as well as the local symptoms disappear, if the disease be not too advanced and time has been gained during which the regular treatment may be continued and relapses prevented. Many such cases have fallen under my observation and have been published in the "Journal des Maladies Syphilitiques de Milan," by M. Corresina, and in my "Annales d'Ottalmologia."

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* A centigramme is ·1544 of a grain.

On Sclerotomy in the Treatment of Glaucoma.

By M. Quaglino, *Professor of Ophthalmology in the University of Pavia.*

At the last Ophthalmological Congress, held at Heidelberg, M. de Wecker did me the honour to mention the cases of glaucoma that I had treated by interstitial sclerotomy, in other words by simple incision of the sclerotic, an operation which corresponds to the first step in iridectomy, as suggested by the late Von Graefe.

M. Wecker also observed that the method he had previously adopted so far differed from mine that he made the incision through the sclerotic with Graefe's narrow cataract knife at the point of junction of the sclerotic and cornea, as in the first step of Von Graefe's modified linear incision, the instrument being then withdrawn without completing the incision, and a small bridge being consequently left in the centre of the wound.

The merit of suggesting the simple incision of the sclera I practise belongs to M. Stelwag, who proposed it some years ago in his memoir "Sur la Tension de l'Œil." M. Stelwag had performed the operation upon a glaucomatous eye, the vision of which was lost some time previously, and he had convinced himself of its efficacy from observing that the intra-ocular tension underwent diminution just as if he had practised iridectomy. M. Stelwag, however, did not try this proceeding in other cases where recovery of vision was possible, and his proposition passed unnoticed by the greater number of ophthalmologists.

M. de Wecker, in his treatise "Sur les Maladies de l'Œil," 2nd edit. p. 571, 1867, in discussing the merits of the operation suggested by Mr. Hancock, and by M. Heiberg of Christiana, who had in view the section of the ciliary muscle, remarks that "the discussion on this subject raised amongst the English surgeons, sufficiently demonstrates that simple paracentesis at the sclero-corneal junction can in certain cases definitively arrest the progress of glaucoma. In our opinion far too much stress has been laid on the excision of a piece of the iris; we think it would be better to fix the attention on the mode of making the incision into the sclerotic, and hold that the operation for glaucoma ought to be less active in proportion as the rôle of the sclerotic in relation to the glaucomatous symptoms is less important."

He adds in a note that were it possible to make a large sclerotic wound near the margin of the cornea without risk of protrusion of the iris, we ought to abstain completely from touching this membrane.

Notwithstanding the justness of these observations sclerotomy has

few partisans, and iridectomy continues to be practised as the only means of arresting the progress of glaucoma. The convictions of these excellent practitioners, as well as my own persuasion, render it a matter of reasonable probability that the cure of glaucoma does not depend on excision of the iris; and the well known fact that the efficacy of the operation bears no relation to the amount of the iris excised has led me to seek other explanations of the enigmatical cure of the affection. No one has as yet suggested any probable explanation of the mode in which iridectomy acts in glaucoma, and even its discoverer stated with his usual candour that it was only an empirical proceeding. But is it not true that if we could discover the connexion that exists between iridectomy and the arrest of glaucoma we might make some progress in pathogeny and therapeutics? In other diseases does it not hold good that the dispersion of error is as valuable as the discovery of truth? Some years have now elapsed since I began to practise simple sclerotomy on eyes of which the vision was lost from glaucoma, without however any hope of restoring sight. Nevertheless, I found that the hardness of the eyes diminished and ultimately disappeared, just as if I had practised iridectomy, whilst the disorders of the dioptric apparatus as well as the arterial pulsation and neuralgia similarly vanished either on the day following, or soon after the operation. The anterior chamber also increased in depth. Having observed that these effects were always produced when the scleral incision was made of sufficient extent (3 mm.), and at a proper distance from the cornea (2 mm.). I adopted the same plan in cases of glaucoma, and found that coincidentally with the disappearance of the intra-ocular tension all the glaucomatous symptoms disappeared as rapidly as if iridectomy had been performed. In some cases the tension fell so considerably that hæmorrhage took place upon the retina, which seriously interfered with the result. I ought to say that I have occasionally had to repeat the operation in consequence of relapses, perhaps due to the incision having been too small; and have, nevertheless, still obtained complete success after the second or even the third operation. In the case of an old man on whose right eye I had operated for glaucoma of long standing with cataract, I performed sclerotomy on the left eye for chronic glaucoma with excellent results; after some months he had a relapse, and I performed the same operation a second time. A month later he returned with increasing impairment of vision, which was worst in the morning but diminished at night, and was accompanied by augmented tension. Ophthalmoscopic examination revealed opacity in the anterior part of the vitreous, which partially cleared towards evening when pulsation of the artery became very evident. I then performed

an iridectomy at the upper part, after which recovery was complete. It is possible that the same effect might have followed a third sclerotomy, but I then feared to run any risk, especially as the patient had but one eye. It will be seen then that I had and have no intention of substituting sclerotomy for iridectomy in every case, but simply to seek truth. To discover this, experience and observation must be multiplied, for we require to know whether the two operations are equally effective, and whether the results are equally durable. Without such information we should not be justified in ostracizing Von Graefe's operation.

At the present time I have records of seven cases in which glaucoma has been more or less completely arrested by iridectomy, besides the two published by M. Demagri, Ophthalmic Surgeon to the great Hospital of Milan. Two of these have had no relapse for a year, whilst in the others six, five, and four months at least have elapsed. An account of some of these cases will be found in the 2nd Fasc. of the Italian *Annales d'Ophthalmologie*, that I have had the honour of editing for last year, and the rest will appear in the 2nd Fasciculus of the same journal for the present year.

It might be thought that prolapse of the iris would always follow the operation of sclerotomy, and indeed it occurred in one or two of my cases where I withdrew the knife suddenly; but since I performed this part of the operation more slowly, pressing gently on the iris and on the sphincter of the pupil which contracts, it has not happened. Sometimes, however, a small fold of the periphery of the iris prolapses on the discharge of the aqueous and becomes adherent to the lips of the wound, which causes a little displacement of the pupil, but usually the pupil contracts and remains round, though its mobility does not augment.

The anterior cicatrix of the wound is sometimes cystoid, a little aqueous continuing to infiltrate beneath the united conjunctiva, but often it heals perfectly and forms a mere line. The former mode of cicatrization has appeared to me to be attended with better results than the latter. Prolapse of the iris when it occurs is best treated by puncture and methodical compression. Its occurrence does not interfere with the good effects of the operation.

How does sclerotomy act in glaucoma? It might be said that it effects a cure by relieving the constriction of the anterior part of the scleral ring which exerts pressure on the highly vascular ciliary processes, causing them to pour forth their natural secretion of the aqueous humour more abundantly into the posterior chamber, and thus producing increased intra-ocular tension and the consecutive train of symptoms characterizing glaucoma. It is easily intelligible how the division of the constriction

and the escape of the aqueous permit the chambers of the eye containing this fluid to diminish, the lens to advance, and to restore the equilibrum of the circulation and of the secretory processes.

But to what are we to attribute the constriction? To the spasmodic contraction of the fibres of the ciliary muscle, as admitted by MM. Hancock, Vose, Solomon, and Heiberg? An affirmative answer might be returned if we reflect that glaucoma usually occurs in hypermetropic eyes, whilst the scleral cut implicates its anterior insertion; but, on the other hand, it must be remembered that the fibres of the muscle are almost always atrophied in glaucoma as a consequence of the intra-ocular pressure. To the inelastic hardness of the sclerotic, caused by fatty degeneration of its layers, as admitted by Coccius, Cusco, and Magni? This congenital induration, caused either by slight rheumatic inflammation, or by senile degeneration, always exists in slight attacks of glaucoma, and no doubt constitutes one of the factors of acute glaucoma. The oblique interstitial incision which penetrates the anterior chamber ought to cause a relaxation of the ocular capsule, but in order that the benefit should be persistent, it is necessary that the internal capacity should be permanently increased. M. Stelwag believed that the increase of the internal capacity of the sclerotic might be rendered permanent by the interposition of connective tissue of new formation occupying the wound, as well as by the backward movement of the anterior layer of the sclerotic after the operation, which was previously most stretched. This explanation has, however, been refuted by M. Schweigger, who, from his experiments and microscopical investigations, has shown that the union of the wound is always immediate, or by the so-called first intention, and that, in fact, there is none of the supposed connective tissue. A little may, perhaps, be sometimes present, especially when the cicatrization is accompanied by the formation of a cystoid cicatrix, or *cicatrice à filtration*, as M. de Wecker has termed it, which is sufficiently common after sclerotomy. It is evident, then, that the good effects of sclerotomy in glaucoma have not as yet received any satisfactory elucidation, though the fact remains that this disease can be cured by a simple incision, and that the removal of a segment of the iris is not indispensable. The nine cases I have observed, and the two very important ones of Dr. Demagri, of Milan, prove not only the fact of the cure being effected by this means, but the permanency of the cure. It may be objected that a relapse may occur after sclerotomy, but this may also happen after iridectomy, and in some comparative observations that I made I satisfied myself that if the intra-ocular tension did not diminish after sclerotomy, neither did it after iridectomy. It appears to me that the incision of the ligament may be avoided; the section of the anterior

insertion of the radiating fibres of the ciliary muscle, which are attached to this ligament and to the internal wall of the canal of Schlemm, and the incision of this venous canal, which is almost inevitable, and often causes abundant hæmorrhage, associated with the inevitable evacuation of the aqueous humour, which fills the anterior chamber, ought collectively to cause relaxation of the ocular capsule, and at the same time exercise great influence on the subsequent reordination of the circulation in the ciliary body and in the venous plexus of the choroid. Thus, gentlemen, you may see that I have no wish to substitute sclerotomy suddenly or rashly for iridectomy, as some have erroneously thought; nor am I able to explain its effects perfectly satisfactorily. My object has been to draw your attention to an interesting controversy and to make some investigation into the cause of the excellent effects of iridectomy. If I can lay no claim to any discovery on this point, I can at least maintain that the removal of a segment of iris is not the essential cause of the curative effects of iridectomy in glaucoma. I should be glad if any of my hearers were led to make some experiments on this point, and if any of you who may perchance have tried sclerotomy would show me that the truth is not where my distinguished confrères, M. de Wecker, M. Stelwag, and myself have supposed it to be.

M. Secondi: The importance of proceeding experimentally in the solution of a question so complicated as that of the mode of action of iridectomy in the cure of glaucoma has led me also to experiment on this point. My experiments with this object in view have been conducted in two different ways. I have performed the same operation as my friend, M. Quaglino, that is to say, I have made an oblique incision through the sclera, thus opening the anterior chamber without touching the iris, and endeavouring as far as possible to avoid the secondary prolapse of this membrane. This I found easy to accomplish by withdrawing the knife slowly from the wound, and by the subsequent application of a bandage. I first made these experiments on eyes already long blind from glaucoma, without in any way aiding the vision. I satisfied myself, however, that all the glaucomatous phenomena underwent considerable diminution, and that the improvement persisted as long as the patients were under my observation, that is to say, for a period of some months. In other cases, on the other hand, I opened the anterior chamber by an incision through the conjunctiva and sclera, at the upper part of the eye, just beyond the ciliary body, seven

millimetres in length at least, with a sharp linear knife and a sawing movement, without penetrating into the cavity of the globe, and without touching the choroid. In one case that I had occasion to send to a German confrère, M. Schiess, of Bâle, who, I regret to see, is not present, I observed not only diminution of the ocular tension and of the other symptoms of glaucoma, but I noticed recovery of central vision, which had been altogether lost before the operation, that is to say, the patient who before the operation had only quantitative perception of light, after the lapse of some days was able to count his fingers at the distance of half a yard. This improvement lasted, however, only for some weeks, but in this instance the atrophic state of the optic papilla afforded little chance of any greater or more permanent improvement. The tension of the eye, which had been diminished by the operation, did not again exhibit any tendency to increase. The wound of the sclera appeared a few days before my departure merely as a black line, with clearly defined scleral edges. I am therefore of opinion that one of the factors in the curative action of the iridectomy is the sclerotic wound. I ought to say that from the effects of the escape of the aqueous humour made by the corneal paracentesis by thirty consecutive operations in eyes which I found in the same condition, I see in the evacuation of the anterior chamber, made simultaneously to the incision in the sclerotic, a second factor in the salutary action of iridectomy.

On the Treatment of Keratoconus.

By Ricardo Secondi.

I desire to speak, not for the purpose of passing any judgment on Bowman's method of treating keratoconus, but in order to make a short communication on a mode of treatment that I have employed with great success. This is the light but methodical application of cauterizing agents to the centre of the projection after removal of the epithelium, but without the prior detachment of the small square flap recommended by Von Graefe. I have been led to adopt this method partly from the great difficulty I always experienced in effecting the removal of the flap without penetrating the anterior chamber, an accident which is not altogether indifferent in nervous and cachectic subjects, partly from observing that the amelioration of the vision by the method of Graefe continued to take place more rapidly when the cauterization was continued for a long period after

the wound was healed, and partly also from having seen an individual affected with keratoconus from the age of twenty, and who had experienced much benefit from occasionally cauterizing the centre of the staphyloma, keeping the disease in this manner within bounds till he arrived at the age of sixty, when I had the opportunity of seeing him. The plan I adopt is as follows:—With the aid of a cataract needle I make a slight abrasion on the apex of the protrusion, and then immediately cauterize this spot with the mitigated nitrate of silver. Atropine is then instilled, which I regard as an important aid in the cure. By the first, or by a second operation I establish a superficial ulceration, and I complete the treatment by repeating the superficial cauterizations two or three times a week for as long a period as three months. The improvement of vision which is perceived after the sixth week continues to make progress, notwithstanding the small spot which forms on the cornea. The amelioration of vision is due, as I have satisfied myself by direct measurement, to the diminution of the curvature of the cornea, which progresses slowly but certainly. In one instance the improvement was so great that I did not find it requisite to make an artificial pupil, the spot being very small and superficial. I ascertained the persistence of the cure in this case a year after I had finished the treatment. I may add that this method of treating conical cornea is entirely free from danger; its only disadvantage is that it is rather long. The difficulty of regulating the effects of the cauterizations is very small, since they are very slight and superficial, and only produce very moderate reaction.

The following abstract contains the most important point of Dr. Robinski's paper. The essay in full will be found in Reichert and Du Bois-Reymond's "Archiv for 1871."

Researches on the Lens of the Eye.

By Dr. Robinski.

In my investigations into the structure of the lens, remembering the difficulties of making examinations of the fresh tissue, I employed very weak solutions of nitrate of silver, which succeeded admirably, bringing out the contours of the epithelial cells and staining the lens-tubes. The strength of the solutions I have used is about one part of the salt to 1000 or to 800 of water, which I consider to be superior in value to stronger solutions, since the former do not so easily form artificial products. The stronger solutions used—V. Recklinghausen—(1 : 400) have the disadvantage of colouring the preparations too strongly, rendering the out-

lines indistinct, and thus leading, as the history of silver staining in various instances shows, to erroneous results.

The weaker solutions are also much more valuable when it is required to preserve the specimens, since they blacken much less in course of time.

The action of the nitrate of silver need not in many cases be prolonged for more than a few seconds, or for half a minute. The lens from a just slaughtered animal may also be examined instantaneously, and we then get normal or very slightly altered appearances, such as can, indeed, be obtained by no other method, and which are invaluable for the study of the relations of the parts in the immediate vicinity of the lenticular stella.

New Mode of Operating for Cataract by Median Sphero-cylindrical Flap.

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The recent progress of ophthalmic surgery could not fail to cause attention to be specially directed to the methods of extracting cataract. The operation of Daviel with the large flap long retained its position as the ne plus ultra of art, though it not unfrequently cruelly, as well as unexpectedly, disappointed the anticipations of even the most practised of operators in cases that seemed in all respects favourable. In addition, this mode of operating is not an easy one, and even when the surgeon possessed the dexterity of a Desmarres, it was impossible to set aside the thousand acts of imprudence that the patient might commit, and the unfortunate events that might occur to spoil the result. Innumerable modifications were in consequence suggested with the object of surmounting difficulties that might present themselves during and after the operation, yet all have proved hitherto more or less unsatisfactory; without mentioning the accidents that may happen as a consequence of the unskilfulness and want of forethought on the part of the operator, the chief objections that may be adduced against it are :—

1. The size of the wound and the facility with which the flap becomes displaced or reversed in position.

2. The disposition to prolapse of the iris between the lips of the wound.

3. The want of correspondence between the pupillary opening and that made in the cornea, which necessitates great displacement of the iris and of the flap, causing much unnecessary violence, the injurious effects of which are only too early visible.

4. The difficulty that occurs in the healing of the wound when an

arcus senilis is present, which, as Hasner has shown, sometimes leads to destruction of the cornea by a kind of necrosis.

For these and for yet other reasons the improvement of the operation has long been a desideratum, though on some other principle than that adopted by Daviel.

Von Graefe, having in view the advantages of evacuating fluid cataracts by small and linear openings, thought that this plan might be generally adopted in cases of soft cataracts or in those having a small central nucleus. But as in many such cases the opening was insufficient in point of size, and as his experience had taught him the harmlessness, or perhaps it might be said the benefit to be derived from iridectomy, he suggested the performance of linear extraction with iridectomy. This happy idea was at once put into practice by a large number of operators, with special modification in different instances, chiefly having reference to the mode and the instruments by which the delivery of the nucleus could be best effected. Thus originated the tractors or curettes of Schuft, of Critchett, and of Bowman. Ultimately the great master, reflecting on his own suggestion, invented the linear operation which bears his name, and which he termed the "modified linear extraction." Thanks to the prestige of the inventor and the high measure of success with which the operation was attended in his hands, it has become very generally adopted, and the most eminent oculists have used it almost exclusively. Yet, although this operation gives very satisfactory results, it must be clearly understood that it is not very easy to execute. The expulsion of the crystalline requires a very dexterous manœuvre, and it is not unfrequently preceded by an escape of the vitreous. Should blood be poured out into the chambers of the eye either from the iris or from the perikeratitic vascular circle, there is nothing left but to fish for the lens with some kind of tractor. This operation is frequently followed, moreover, by slight inflammatory complications, necessitating at a later period further surgical interference if the best possible result be desired. The wound in the cornea is a point of capital importance, and it is made as small as possible, but it is to the detriment of the iris, which suffers by way of compensation. Doubtless the ablation of a portion of this last is relatively a matter of small importance. The hiatus in the circle of the iris, situated above and capable of concealment by the upper lid, has little injurious effect upon the result of the operation; but that which is the most important point of all is that this proceeding gives a higher measure of success than any other. It is not less true, however, that it is undesirable that the iris should undergo any mutilation, since this lesion, without being of a serious nature, leads in many instances to a certain amount of

inflammation, to exudation, and, as a consequence, to more or less complete obstruction, or even to occlusion of the pupil. It is doubtless true that the sclero-corneal situation of the wound is more favourable to cicatrization than section through the cornea alone, but it may be affirmed that it is especially liable to be accompanied by irido-cyclitis, to cystoid cicatrices, and sometimes even to sympathetic ophthalmia; lastly, in a certain number of cases the degeneration which accompanies the arcus senilis hinders cicatrization, and I have seen more than one case where a fistula corneæ remained for a long time, and the globe has since atrophied. The eye operated upon being reduced to the rôle of a dark chamber, destitute of a lens, it is more indispensable than ever, in order to obtain clearly defined images, that the opening should be as narrow as possible; and this without speaking of the office of diaphragm fulfilled by the iris, which has not only to act synergetically with the accommodation, but, in addition, to follow the variations in the intensity of the luminous rays, and to regulate the quantity of light falling upon the retina.

In fine, then, it may be said that if this operation be excellent in practice, it is somewhat irrational theoretically, and it may even be added that it is contrary to the conservative tendencies of modern surgery.

Can nothing better then be substituted in place of it? Has every means of operating been exhausted? Let us begin from the beginning. Experience and anatomical notions have clearly established that the only place where it is rational to make an opening for the extraction of a cataract is the cornea. The problem to be solved is this: to enable the opaque crystalline lens to escape by the smallest opening possible, with the least amount of violence to the organ and with the least risk both at the time and subsequently.

In order to make a solid body pass through as narrow an opening as possible, it is requisite that this must bear some relation to the form of the body, or at least be capable of adapting itself to that form. If we apply this principle to the globe of the eye and to the crystalline lens, it is obvious that the length of the cut should equal the greater diameter of the lens, and that its lips should be capable of separating to the extent of its thickness. To do as little damage as possible, the lips of the wound must separate on slight pressure, the lens have a very short course, in order to escape, and the pupillary opening by which it issued be in direct relation with the opening in the cornea; in other words, the effort of expulsion should be entirely concentrated on the spot at which the foreign body must pass out. The small size of the wound, the slight amount of displacement of the parts, in a word, the careful avoidance of

all violence, will prevent the occurrence of any accidents during, as well as after, the actual operation, provided that the lips of the wound are in coaptation, and do not permit the iris, pressed forward by the fluid contained in the globe, to prolapse.

So much being granted, we must make an opening that is nearly coequal with the width of the cornea, and it must be made opposite the pupil, and easily adaptable to the two diameters of the lens. Certain operations performed by the large flap, badly executed, show that the corneal flap ought not to extend to the periphery. Moreover, the operation of Küchler has established the fact that the lens can be made to escape through a simple straight cut in the median region of the cornea. Nevertheless, when these defective manœuvres have been closely observed, it is evident enough how much effort is required, how much contusion of the iris and of the lips of the wound is necessary in order to permit the cataract to escape. The median position of the opening is doubtless favourable, the length of the incision is sufficient, but the separation of the lips of the wound, and the escape of the lens is too difficult.

Every section made in this part of the cornea with a large knife (as in the flap operation), or more correctly speaking, *every incision made in one plane, is insufficient.* We have thought out a different mode of making the section, and in place of making the edge of the knife traverse a single plane we make it perform a curvilinear movement; that is to say, we make a cut in the cornea which represents the intersection of a cylinder (movement of the edge of the knife) with a segment of a sphere (the cornea). We still, therefore, make a flap, but by a proceeding offering two peculiarities. 1. The flap is central, occupying the median region of the cornea. 2. The section is made in a curvilinear direction and the flap is sphero-cylindrical.

The description of the proceeding will make these two points more clear.

The patient being placed in the ordinary position for cataract operations, the globe is fixed by the operator with the aid of a point or pair of points, or even by a pair of forceps held in the left hand and applied at a distance of two or three millimetres from the internal border of the cornea and a little above its transverse diameter. Then, taking a long and narrow knife in the right hand (like that of Von Graefe), the point is made to penetrate at the outer edge of the cornea, two millimetres below its transverse diameter, in such a manner that the cutting edge is turned slightly forwards, whilst the flat surface makes an angle of about 20° with the plane of the iris.*

* This inclination is for the purpose of avoiding the possibility of the iris curling over the edge of the knife in the event of a premature escape of the aqueous humour.

The instrument is then pushed horizontally, and should make its way out at a corresponding point on the other side of the cornea. This done, by means of a few sawing movements of the knife, made in such a way as to cause it to describe the segment of a circle forwards, the section is completed by cutting out at right angles to the cornea at the junction of its middle and upper thirds, or perhaps still better, at about the level of the lower border of the pupil.*

The section finished, and a minute's rest being allowed to the patient, the operator lacerates the capsule freely, and then proceeds to the extraction of the cataract by exercising gradual and careful pressure through the lower lid or with a curette, pressing a little below the cornea, and at the same time encouraging the patient to turn his eye downwards slightly and gently. The lens first of all rotates upon its transverse axis, occupies the pupil, and presents itself directly and naturally in the corneal wound, which has been already made to gape by the pressure below the cornea, and then makes its escape regularly and with the greatest ease.

But in those instances where, from one cause or another it does not do so, though always in consequence of some error committed while making the section or during the process of expulsion, it is well to have at one's command a small hook, which, if needed, would assist in the removal of the lens separated from its capsule. Sometimes it is advisable as a preliminary step to depress the posterior lip of the wound by means of the curette, for the easier the lens makes its exit the less is it liable to leave fragments of cortical matter behind it. When this is the case, as they are generally situated behind the upper margin of the wound, or still more frequently behind the upper part of the iris, we should wait till a little of the aqueous humour is secreted, and then diminishing the space between the iris and posterior capsule by pressing with a curette upon the upper lip of the corneal wound, we are able by making slight lateral

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* There are some details of considerable importance in making this section of the cornea. If you move the cutting edge of the knife as it advances parallel to the base of the incision, the cornea, not being rigid, folds itself over the instrument ; the length of the cut then becomes considerable, and the resistance proportionate. Besides this, in consequence of this folding over, instead of obtaining a curvilinear section through the cornea, we have a flap more or less straight in its upper part, that is to say a flap on three of its sides rectilinear, instead of which I propose a flap of one regular curvature. In order to avoid this we must take care to cut the two sides of the cornea at the same time, as by elevating with alternating movements the edge of the knife the incision will only be effected on one side at a time. By proceeding in this way we can make the typical incision, and with as much regularity as though it were made upon a rigid sphere.

movements to dislodge very easily the cortical fragments which lie behind it, as they make their escape with the aqueous humour.

To sum up, my method of operating has this special feature, that it makes through the middle of the cornea, at about its middle third, a flap with a curved or sphero-cylindrical outline, as described above. Such a section results in a flap which has its sides bevelled and presents a vertical edge above. This shape has the advantage of preventing any prolapse of the iris at the sides. The posterior edge of the cornea regularly bevelled, fits in with the corresponding edge of the flap, after the fashion of a watch-glass. At the upper part, where the section is almost perpendicular to the cornea, it is observable that the iris cannot become entangled, inasmuch as it is made opposite the centre, or even rather below the upper edge of the pupil.*

This direction of the cut is necessary to the ready escape of the lens. After first of all making myself sure that there is no danger of any prolapse of the iris, I never fail to dilate the pupil by repeated instillations of atropine. Of course the pupil contracts at the moment the aqueous humour escapes, but this contraction is not so complete as it would be if atropine were not used, and after the anterior chamber has been restored the pupil remains larger than it would have been had atropine not been employed. The other stages of the operation are exceedingly simple. You may use the compress-bandage of Von Graefe, or perhaps still better, a light pad of linen may be adapted to the eyelids, soaked in tepid water, and kept in position by a single turn of bandage, as Mr. Critchett does. From time to time the dressing is to be moistened, and is renewed night and morning, and the patient is kept as quiet as possible. Confinement to bed is not necessary, except during the first twenty-four hours, after which the patient may get up without danger if

* It sometimes happens if the section be made rather too high, whether as the result of unskilful manipulation or because the pupil is too contracted that the line of section involves the iris itself. By way of guarding against this, and also on account of the retraction of the flaps, it is advantageous, perhaps, to finish the flap obliquely to the cornea in such a way that the upper edge forms also a very slightly bevelled edge. This can best be done by giving the knife a slight inclination upwards when two-thirds of the thickness of the cornea have been cut through, so that a very short overlapping edge of the upper lip is obtained. I suggest this proceeding as being applicable to cases where the flaps, by retracting too much, have not approximated sufficiently to become united by first intention, and especially where, owing to their feeble vitality, the edges of the wound swell very little by any exudation. I think I have observed two or three facts which admit of no other explanation, and where it has even been necessary to irritate the edges of the wound in order to cause any swelling and to obtain any union, which would then occur at the end of three or four days.

it is understood that he must take every precaution. This plan relieves the monotony of a long day in bed, has a good effect on the spirits, and by stimulating the various functions of the body insures a good night's rest. By thus paying attention to physiological conditions, we favour the repair of the injured organ no less than its proper nutrition. I need not take up more time in describing the after-treatment, because it in no way differs from that generally employed in this kind of case.

The following are the advantages which I attach to this method:—

1. A corneal wound, made with a reasonable object from the double point of view of theory as well as practice; for on the one hand, it is made in a definite well-chosen spot, and is in every way adapted to the size and shape of the crystalline lens; whilst on the other hand, experience proves that the cicatrization is as rapid and as complete in the middle of the cornea as it is at its periphery.

2. Its execution is easier and it offers security against accidents during the time of its performance; the vitreous humour is not likely to escape before the removal of the lens, because this latter, the iris and the cornea, afford the necessary barriers.

3. A direct correspondence between the pupillary aperture and the corneal wound, so as to allow an easy escape of the lens, a more easy exit in fact, and holding out much less risk than the old method by a large flap, since the back of the iris is not exposed to any violence, when it forms in some measure a covering for the lens at the moment of its escape.

4. The exact adaptation of the bevelled edge of the cornea to the shape of the lens, which admits of the escape of the latter through the smallest possible opening, without causing too much disturbance of the whole organ, and of the humours it contains, and without bruising the iris or the edges of the corneal wound.

5. The iris, safe from accident during the operation, has no tendency to prolapse, in which case there would always be time to cut off a piece of it with no more danger than in the proceeding of Graefe.

6. Exact coaptation of the edges of the wound with no possibility of the flap being turned up.

7. On account of the diminished sensitiveness of the centre of the cornea this kind of section is less painful than that made through the periphery, and especially than that through the sclero-corneal region.

8. Rapid recovery: I have seen perfect union occur on the third day, with a normal anterior chamber and a curvilinear line as the only trace of the operation.

9. When the formation of the cicatrix is complete, especially after

the lapse of some months, there is hardly any trace of wound visible in the cornea, certainly no more than resembles a scratch in a spectacle-glass, and not in any way likely to impair vision, inasmuch as it is situated opposite the upper margin of the pupil; sometimes even higher than this, for the pupil generally becomes smaller than before the operation.

10. The operation is as much as possible conservative, because it does not interfere with the iris, a theoretical no less than a practical advantage, because the eye being brought to the condition of a camera obscura, it is all the more important that the iris in performing its functions should contribute to the formation of perfect images by diminishing the diffusion of the rays of light.

As to acuteness of vision, it is as good as in cases of flap extraction. I have never observed any astigmatism, and it has never occurred to me to meet with a faulty cicatrix after the operation.

A practical objection which may be made to the proceeding, is the possible formation of adhesions between the cornea and iris. I have already said that prolapse cannot occur, except through unskilful manipulation: but if union by first intention should not occur, if a fistula should remain for several days, and if the iris become the seat of any inflammation, there is reason to fear that exudation might cause more or less adhesion between the two structures. Generally this adhesion is no more than a mere band of lymph, and not a firm connexion, as in the case of a prolapse of the iris or when there has occurred a "leucoma adherens." I have often met with these adhesions, and I can recall four cases where they have caused no inconvenience; more than this, I have seen them at the end of some months become elongated to such an extent that they eventually formed but a mere thread, as in certain cases of pyramidal cataract. These adhesions are especially to be feared when the flap is not perfectly curvilinear. I have satisfied myself on this point in a certain number of cases. M. Warlomont, the Director of the Ophthalmic Institute, having at the commencement of this operation an idea that he could facilitate its execution by entering the knife first of all parallel to the iris and then turning it rapidly at right angles, completed the section perpendicularly to the cornea. He obtained in consequence a flap with corners more or less rectangular; and what was often the result of this, if the retraction of the corneal tissue went too far, there remained a gap at the angles of the wound, in which the iris very often became fixed, and then synechiæ resulted, but no prolapse.

Can it be said that the new method of proceeding is to be preferred to all the other modes of extraction? I have no such idea, but I never-

theless affirm that it combines all the advantages of the old flap extraction without its most serious drawbacks. In certain cases I should prefer the plan of linear section, because of the small amount of injury done to the cornea, especially when this latter has but little vitality and no tendency to furnish the amount of plastic exudation necessary for proper cicatrization, and is very thin and feebly nourished, as very often happens in the case of cachectic old men with sallow complexion and wrinkled skin, and who are the subjects of atheromatous degeneration; in short, whenever there is a risk of causing suppuration of the cornea, as in cases of diabetes. There are cases too in which the linear operation is especially indicated, cases in which there are posterior synechiæ, and where it is as necessary to perform an iridectomy as to secure the escape of the lens.

It is the fashion now-a-days to compare the various methods of operating by the aid of statistics, and to judge them by means of the amount of success they show. This, in the case of an art essentially experimental, is no doubt of importance; but without discussing the arguments usually adduced against this plan of proceeding, what a number of errors is it not liable to? Not only are the operators different, but the cases and their attendant circumstances vary, and in order to attain any result enormous statistics are wanting, in order that all the accidents may in some sort balance each other. I must unfortunately own that my experience is not sufficient, and though I have performed the operation since the winter 1868-69, I can adduce but two dozen, instead of two or three hundred cases, which would be necessary for this purpose; however, M. Warlomont has put his experience in the place of mine, and has been willing to help me with his counsel and with his advice. I am but doing my duty here when I thus make him all my acknowledgments.

In addition, Mr. Critchett, in several articles which he has published in the *Medical Press and Circular* during April and May of this year, has approved of, and has spoken favourably of, the plan of proceeding, after having seen me perform it, and having tried it himself in a sufficient number of cases. If, then, I am unable to present my work backed by the results of my own personal experience, I have at least the advantage of being able to appeal in its favour to two eminent men who both enjoy the titles of great weight in ophthalmology.

In conclusion, having faith in the principles on which my plan is based, I leave it to the scientific criticism and to the experience of my colleagues.

The farewell banquet, organized by Mr. Soelberg Wells, took place at 7 P.M. in the Crystal Palace, Sydenham. About 100 guests, including several ladies, were present.

At the dessert, M. Warlomont, Vice-president, gave the following toast :—

"It is now almost fifteen years since the first Ophthalmological Congress was held at Brussels. A numerous and brilliant company assembled, and several amongst you, no doubt, retain a pleasant recollection of that meeting. I was one of those who had the honour of welcoming you. Our enterprise was not considered to be very promising, but we entertained no doubts upon the subject, for we felt that we could rely upon your disinterestedness and devotion to science. The result exceeded our anticipations, for more than 200 ophthalmic surgeons came to us from all parts of the world ; who, except for this, would probably never have met, and for eight days exchanged their thoughts and sentiments ; they separated with sincere regret. Happily that separation has proved to be only temporary. Who has not lost himself in some foreign city, and felt that in meeting with one of his confrères he has found a friend, and that he is certain at least of kindness and hospitality ? Others again, of a so-called practical turn of mind, have admitted the possibility of the reunion, but have asked what good will arise from it ? Are not, they say, all congresses sterile, and why should this be different ? The answer is ready, for no sooner had we separated than a large number of papers appeared, some fugitive, others of more sterling value. Emulation was excited. No one wished to be left behind in the great race, and this has led to scientific progress in this department which has never been surpassed in any other branch of human knowledge. But it was objected that such emulation would only lead men of mediocre talent to press forward and mount on the solid pedestal reared by the labours of others. This, however, is a matter of little importance. Genuine ability will always carve a path out for itself; and I need scarcely recall to those who assisted at our first reunion its most striking incident. For myself, I can still conjure up in imagination the pallid yet expressive face of the young man who only ventured to speak at our reiterated request. I can still hear his sympathetic voice giving in vivid language an account of one of the greatest dis-

coveries ever made in medical science. I can still recal the loud applause with which he was greeted. Albert de Graefe, to whom be all honour, there acquired that position which no one has since disputed with him. To him was committed the charge of the flag of ophthalmology, and the radiations of this brilliant intellect opened up new and previously unknown paths, closed, alas! too soon for him, by the hand of death! To those who still doubt our vitality, I need only point to our presence here. We have met in old England, which admits neither adventitious glory nor obsolete institutions. Our meetings are held in an edifice where for many years the most eminent of our profession have mingled together, and who, by their hospitality, show you in what estimation they hold you. I trust I may be permitted, in the name of the visitors around me, to acknowledge our sense of the kindness that has been shown to us. Thus, gentlemen, as the result of our meeting in 1857, you see the position of ophthalmological science has been considerably elevated, its professors have distributed themselves throughout the whole world, and we now form an important union, which is constantly augmented by the accession of new members. These are results of which we may speak with justifiable pride, and which constitute a sufficient reply to the detractors of our legitimate hopes and our imperishable future. Imperishable, indeed, for have we not determined this very morning, if it please God, to meet again in four years? A sad day did indeed come upon us when our noble colleague was struck by death, but we may remember that, as there are no absolutely useless mortals, so there are none that are absolutely indispensable. Our helm is in experienced hands, who will preserve us from shipwreck. Let us drink to the health of the helmsman—M. Donders." (Applause.)

Toasts were then proposed and drunk with all enthusiasm to Mr. Bowman, the leader of ophthalmology in England, and to M. Warlomont, who first suggested and carried into effect the idea of an Ophthalmological Congress.

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